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ON  
CORPORA LUTEA.



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Doct: Vincenzo Martini  
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Boston. U.S.A.  
May. 18<sup>th</sup> 1853.

PRIZE ESSAY.

Handwritten musical notation on a staff, featuring various notes and rests.



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ON

THE CORPUS LUTEUM

OF

MENSTRUATION AND PREGNANCY.

BY

JNO. C. DALTON, JR., M.D.

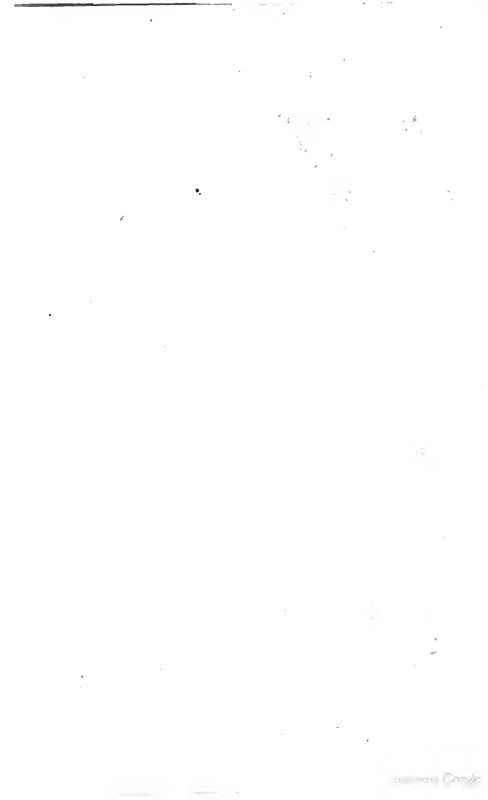


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1851.



# ON THE CORPUS LUTEUM

## OF

### MENSTRUATION AND PREGNANCY.

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#### INTRODUCTION.

THERE exists among medical writers at the present day a very confused idea with regard to the corpus luteum. Notwithstanding the endless controversies that have been carried on respecting its origin, growth, and structure, there is still a great diversity of opinion on all these points, even among those who have personally devoted their attention to the matter; and for the general reader it would certainly be impossible, from the various accounts which have been published, to arrive at any satisfactory conclusion. These contradictory opinions prevailed not only in the earlier epochs, when Haller\* denied positively that corpora lutea were ever to be found in virgin females, and when Meckel† considered them as glandular structures, destined to secrete a sort of "fluide générateur," or female semen; but even at the present day, when so much additional light has been thrown on the whole history of generation, a similar diversity exists; and the corpus luteum is now described by different authors as a development of the outer and of the inner membrane of the Graafian vesicle, as a deposit between the two membranes, and as a growth external to both. Perhaps the most debatable question of all relates to its connection with conception and pregnancy. At an earlier period, this was simply a question whether corpora lutea ever existed in the ovaries, except as a consequence of impregnation: some writers, with Haller, denying the

\* First Lines of Physiology, Am. ed., 1803, p. 430.

† Manuel d'Anatomie, vol. iii. p. 736.

possibility of such an occurrence, while others asserted that they had frequently observed them in virgin animals and unmarried women. In later times, however, it became a question of the possibility of establishing a distinction between *true* and *false* corpora lutea; *i. e.*, those which resulted from impregnation, and those which owed their origin to some other cause. Notwithstanding these differences, however, it has been always reducible to a single very interesting and important inquiry, *viz.*, whether, from the existence of a "corpus luteum" in the ovary, it can with certainty be inferred that impregnation has taken place.

Among those who considered the corpus luteum as necessarily connected with impregnation, many, like Haller and Meckel, had no conception of the spontaneous discharge of ova during the season of heat in the lower animals, and at the period of menstruation in the human female; a process which has recently been more or less generally recognized as a regular and natural function. Consequently, they regarded the corpus luteum as only resulting from sexual intercourse, or, at least, from some extraordinary excitement of the generative system. William Hunter, in his plates of the human gravid uterus, gives drawings of the corpus luteum as an acknowledged and indubitable accompaniment of pregnancy alone.

John Haighton,\* in a paper on this subject in the *Philosophical Transactions*, comes to the following conclusion: "I may then say that no corpora lutea exist in virgin animals; and that, whenever they are found, they furnish incontestable proofs that impregnation either does exist, or has preceded." He does not, therefore, recognize any distinction between corpora lutea, nor the possibility of any discharge of ova independent of sexual intercourse. He unconsciously, however, himself furnishes evidence that such discharge may take place, in his various experiments in which the oviducts were divided before and after coition; corpora lutea being found in the ovaries in both instances. "We should expect," he says, "in the one case to find the full effects of impregnation, and in the other no traces of it would be seen. Instead of which, the procreative actions (formation of corpora lutea) are no further advanced where there has been an opportunity for the passage of the semen, than in those cases where its passage has been impossible." He attempts to explain this apparent contradiction by supposing that the ovary

\* Phil. Trans., 1797, p. 114.

is excited to the expulsion of the ovum by "consent of parts;" the stimulus of the seminal fluid in the uterus being sufficient to cause the rupture of a Graafian vesicle, although its passage to the ovary has been interrupted. It apparently does not occur to him that the assumed connection between the corpus luteum and a preceding coition is entirely without proof; and that, without this assumption, there would have been no discrepancy in the appearances which he is at so much pains to reconcile.

Cruikshank\* also relates an instance, in the human subject, in which the rupture of a Graafian vesicle was not improbably quite independent of coitus, without in the least suspecting the true nature of the case. "I also have," he says, "in my possession the uterus and ovaries of a young woman who died with the menses upon her; the external membranes of the ovaria are burst at one place; whence, I suspect, an ovum escaped, descended through the tubes to the uterus, and was washed off by the menstrual blood." The writer, however, as may be gathered from the context, evidently supposes that the escape of this ovum was in consequence of coitus; since, throughout his paper, he considers the occurrence of a corpus luteum as direct proof of impregnation.

Velpeauf speaks of the corpus luteum as a growth taking place "after coition," without alluding to the possibility of its formation under any other circumstances.

Montgomery† takes much the same view of the matter. He speaks of the maturation and discharge of an ovum, and the accompanying growth of a corpus luteum as taking place "on the occurrence of conception;" and, though he acknowledges that bodies resembling corpora lutea may be produced in the ovary by other causes, yet the true corpus luteum, resulting from impregnation, may, according to him, be always distinguished from them. "Such," he says (p. 240), "is the result of my own observations on a very large number of bodies, both of women and animals; and in no one instance did I ever find a true corpus luteum, except as the product of conception." He gives some marks by which the true corpora lutea are to be distinguished from the false, but his description, in this respect, must be regarded as somewhat imperfect. The yellow matter of the corpus luteum he considers to be surrounded by the outer membrane of the Graafian vesicle, while its cavity is lined by the inner, it being enclosed between the two.

\* Phil. Trans., 1797, p. 135. † Treatise on Midwifery, Meigs' ed., Philad., 1831.

‡ W. F. Montgomery, Signs and Symptoms of Pregnancy, London 1837.

Dr. Gross\* recognizes the occasional existence of false corpora lutea, which, he says, may be produced without coitus, in consequence of "strong sexual excitement." He concludes, however, principally following in the track of Montgomery, that the true corpus luteum is good evidence of pregnancy.

Dr. Edward J. Seymour,† though he acknowledges that corpora lutea *occasionally* exist without impregnation, inclines to the opinion that, as a general rule, they are good evidence of its having taken place. "From these premises, comparisons, and observations," he says (p. 32), "my opinion has been formed that corpora lutea are the result of the change which takes place in the ovarium by the bursting and discharge of the ovum—occurring rarely in virgin animals, because the bursting of an ovum is not a frequent but only a possible occurrence, but always following impregnation, and diminishing as gestation proceeds."

Dr. Blundell‡ expresses himself on this point with great reserve. He thinks that, in some of the lower animals, a corpus luteum, "not to be distinguished from that of impregnation," may be produced without sexual intercourse, and merely by great nervous excitement; and he is not prepared peremptorily to decide the question even with regard to the human female; but considers, nevertheless, a "fabi-form corpus luteum, with an asteriskal cavity," &c. &c., as strong presumptive proof of impregnation.

J. Müller§ regards the discharge of ova as a consequence of sexual intercourse, and must therefore hold the same opinion with regard to corpora lutea. "In mammalia," he says, "the separation of the ovum from the ovary seems to be dependent on the act of impregnation. It has, it is true, been stated that cicatrices of the ovaries, resulting from the escape of ova, have been seen in the bodies of virgins; but this is certainly no ordinary occurrence."

Dr. Carpenter|| adopts principally Montgomery's description of the corpus luteum, and his opinion that it is a good sign of impregnation. He has, however, no original observations on the subject. He also regards as "not improbable," the theory that ova are matured and discharged, at each menstrual period, independently of fecundation; though he thinks, with Dr. Barry, that it is more likely

\* S. D. Gross, *Elements of Pathological Anatomy*, Philad. 1845.

† *Illustrations of some of the Diseases of the Ovaria*, London 1830.

‡ *On Diseases of Woman*, Philad. ed. 1840.

§ Müller's *Physiology*, Philad. ed. 1843.

|| *Principles of Human Physiology*, Philad. ed. 1843.

that the matured ova retrograde and become absorbed, without having been discharged.

Dr. Robert Lee\* admits a distinction between true and false corpora lutea, or those connected with impregnation and those arising from other causes. His ideas, however, regarding the precise process which takes place in menstruation do not seem to be very clearly announced; for, although he considers it probable that about the menstrual period there is a rupture of the Graafian vesicle, he nevertheless denies that an ovum is discharged at this time. "That an ovum," he says, "does not pass from the ovarium during menstruation is evident from the fact that an ovum is never found but as a consequence of impregnation, and that conception does not take place during the menstrual period."† He describes the yellow matter of the corpus luteum as situated externally to both layers of the Graafian vesicle, without anything interposed between it and the ovarian tissue.

Dr. Robert Paterson has two papers on this subject in the *Edinburgh Medical and Surgical Journal*, in the first of which (January, 1840) he gives a somewhat extended notice of the distinguishing marks of "true corpora lutea," i. e., those consequent on impregnation; and he concludes that the corpus luteum, provided certain appearances exist, is "undeniable proof that the individual has been pregnant." Dr. Paterson describes the true corpus luteum as deposited between the layers of the Graafian vesicle. The false he considers as arising principally either from (1st) a more or less complete filling of a Graafian vesicle with blood independently of impregnation, or (2d) undefined effusions of blood into the substance of the ovary; a true apoplexy of the organ. They may, moreover, arise from re-absorption and puckering of a vesicle, or from various morbid deposits. He recognizes the spontaneous discharge of ova only to a limited extent. "The period of menstruation," he says, "is marked by the prominence of one or more of the Graafian vesicles, and by their occasional rupture." A more common occurrence, however, he thinks to be "simple enlargement of a vesicle, the increased quantity of fluid in which becomes afterwards reabsorbed." Dr. P.'s communications are accompanied by a number of observations and coloured drawings, illustrative of the difference between true and false corpora lutea. These, however, do not seem to

\* Lectures on Midwifery, London Med. Gazette, 1842.

† Cyclop. Pract. Med. iii. 444.

be quite perfect, as some of his cases, related under the head of "true corpora lutea," are entirely deficient in evidence of impregnation, and in some of his drawings he designates as mere "puckered cysts," &c., what are evidently corpora lutea of menstruation, in a retrograde state.

Dr. Frank Renaud, of Edinburgh, has a highly interesting and valuable paper on this subject in the *London and Edinburgh Monthly Journal of Medical Science* for August, 1845. The plan of the memoir is somewhat similar to that of Dr. Paterson's, and it gives by far the clearest and most accurate account of true and false corpora lutea that I have anywhere been able to meet with. Dr. R. takes much the same view with Dr. Paterson of the processes connected with menstruation, viz., that "towards each menstrual period the Graafian vesicles become developed," and "sometimes burst." He does not, however, consider this as a regular and natural occurrence; nor does he describe the false corpora lutea as always connected with menstruation.

It will be observed that a certain proportion of the above writers speak of the corpus luteum as a sign of pregnancy, without mentioning its particular marks or distinctive characters; while those who have given a more detailed description of it mention also certain other bodies, false corpora lutea, which they consider as occasional morbid or extraordinary growths, varying in their nature, and accidental in their formation.

On the other hand, are a crowd of observers, who, in the earlier times, met with "corpora lutea" in virgin women or in virgin animals. Malpighi, Valisnieri, Santorini, Brugnone, Bertrandi, are all cited by later writers as having borne testimony to this fact. Neither have others been wanting, in modern times, to sustain a similar view.

Dr. John Burns,\* indeed, expresses himself somewhat doubtfully in regard to it. "It has been conjectured by some," he says, "that the corpus luteum may be produced even without sexual intercourse; but this point *I cannot determine*." He does not, however, speak of the corpus luteum as positively existing in company with any other uterine production than a fœtus or hydatids. "The appearances during life, or after death, which occur from a miscarriage, may also arise from the expulsion of hydatids;" in which case "even a distinct corpus luteum may be discovered." Dr. Burns

\* *Midwifery and Diseases of Women*, James' ed. 1813.



does not here make any distinction between those hydatids which evidently result from a degeneration of the ovum, and those which are supposed to constitute a true morbid production of the uterus; he appears, however, to consider them all as belonging to the former class.

Sir Everard Home, in his two papers on corpora lutea in the *Philosophical Transactions*,\* denies that there is any difference between the corpora lutea resulting from impregnation, and those which are produced independently of any such influence. He gives a very confused and unsatisfactory account of some observations which he adduces "in proof" that corpora lutea are not bodies formed in consequence of the discharge of ova, but are the glandular structures in which the ova are produced; that they are "formed previous to and independent of sexual intercourse; and that, when they have fulfilled their purpose of forming ova, they are afterward removed by absorption, whether the ova are impregnated or not." He even goes so far as to say that physiologists have been led into the error of "mistaking a corpus luteum in which an ovum is forming for that which belonged to the ovum of the present conception, and which, at the time of delivery, has disappeared;" and that it will be found that "all the preparations of corpora lutea, from the ovaria of women who die in childbed, actually belong to this new ovum, not yet completely formed." It is impossible, however, to discover in either of the papers anything like "proofs" of these extraordinary assertions; unless, indeed, a drawing may be considered as such which he gives of a corpus luteum, imbedded in the substance of an ovary, and containing a very dubious-looking body, which the writer calls an ovum, but which is entirely unlike the ova, as seen by other observers, while yet contained within the ovary. The accuracy of his logical inferences may be estimated from the fact that he regards the presence of a hymen as proof positive of virginity.

Sir Everard Home admits that ova do pass from the ovaries anteriorly to impregnation, but does not seem to think this an occurrence which takes place in the human female at any regular period. He denies explicitly that it has any connection with menstruation; for, after relating the case of a girl who died seven days after an expected menstrual period, and in whom the ovary was found to contain two "corpora lutea," and the uterus an ovum of minute size,

\* Phil. Trans. 1817 and 1819.

he says, "It is clear, from the case which has just been stated, that such (menstrual) periods are totally unconnected with the formation of the ovum, the process of its leaving the ovary, or its impregnation."

Dr. Dewees\* adopts, without discussion, Sir Everard Home's view of the matter.

Dr. Gooch,† though he at first speaks of the corpus luteum as formed from the rupture of a Graafian vesicle "after conception," does not allow that the two are necessarily connected as cause and effect. "Some persons," he says (p. 87), "will pretend to say, from an inspection of the ovary, how many conceptions have taken place, but corpora lutea have been seen in virgins." This statement, however, is entirely unaccompanied by proofs, or by any detailed description of the bodies in question.

Boivin and Dugès, in their treatise on *Maladies of the Uterus*,‡ give no very clear description of corpora lutea, nor any decisive opinion as to their nature. It is merely stated that they have often been found in "unmarried" females. In the atlas, there is one figure of an ovary, showing the external cicatrix of a corpus luteum, but no internal view.

T. Wharton Jones§ recognizes the periodical discharge of ova from the ovary, but does not consider this occurrence as ordinarily resulting in the formation of a corpus luteum. He ingeniously accounts for the supposed fact that every such discharge is "not followed by a corpus luteum," as follows:—

I. The regular and periodical discharge of ova takes place without increased action, and consequently leaves little or no trace.

II. Coitus hinders the maturation and discharge of ova by inflammation and exudation, which result afterwards in the corpus luteum.

III. When coitus coincides with the regular maturation of a Graafian vesicle, no corpus luteum is formed.

He acknowledges, however, that this is "physiological speculation," and says that, practically, "it would be rash and unwarrantable for any one to pronounce, from the occurrence of a corpus luteum in the ovaries, that coitus had taken place."

\* *System of Midwifery*, Philad. 1826.

† *Gooch's Midwifery*, Philad. ed. 1832.

‡ *Heming's Translation*, London, 1834.

§ *London Medical Gazette*, vol. xxxiv. p. 625.

Dr. Robert Knox\* also thinks that ova "may often" be discharged from virgin ovaries, corpora lutea being formed in consequence; but he does not look upon this as an established fact. Though he institutes some comparisons between the true and false corpus luteum, the distinctions which he lays down are very imperfect, relating chiefly or entirely to the comparative size of the bodies; and from his observations and details he finally draws the following conclusion, viz., that "there is no distinctive character by which the corpus luteum (of impregnation) may be distinguished from the miniature (or false) corpus luteum."

The above details will serve to show how various are the opinions, and how contradictory the statements, which have been brought forward by medical writers on this subject. When, however, it became more perfectly established, from the recent researches of physiologists, that a regular and periodical maturation and discharge of ova take place, not only in the oviparous animals, but also in all classes of mammalia, entirely independent of fecundation, and even of coition, an additional and almost decisive argument seemed to be afforded to the opinion of those who denied that any peculiar appearances were produced in the ovary after fecundation which could be regarded as evidence of that occurrence having taken place. For, if the ovum is matured and expelled from the ovary independently of any external influence, and is only fecundated at the time of its expulsion, or during its passage through the oviduct, how could this later and accidental occurrence have any influence on the ulterior changes in the ruptured Graafian vesicle—changes with which it had no necessary or physiological connection? It resulted, as was said, not only from analogical inferences, but also from the observation of nature, that the corpus luteum is formed in the ovary, after the discharge of the ovum, in the same regular and uninterrupted manner, whether that ovum becomes subsequently fecundated by the spermatic fluid, or whether, as more frequently happens, it rapidly loses its vitality, and is destroyed. Such an apparently superfluous production of ova, destined to perish without ever receiving impregnation, was not without abundant analogy among the lower orders of organized beings. It had been long known that the spawn of fishes were expelled by the female, independently of any direct influence from the male; and that their subsequent fecundation depended entirely on the occurrence of

\* London Medical Gazette, vol. xxxiii. p. 370.

fortuitous circumstances. In the vegetable world, the dioecious plants presented the same phenomenon; many thousand germs being annually produced by the female individual, of which only a small proportion were destined ever to receive the fructifying influence of the pollen.

Bischoff\* was among the first who announced this theory in a decisive manner. He was first led to a knowledge of the fact by some appearances which he met with in an experiment on animals in June, 1843, and communicated his discovery in a letter to the French Academy on the 17th of July following. He afterwards brought the matter before the public in a more extended form. In this work, Bischoff shows by actual observation that the Graafian vesicles become ruptured without coition, and in the lower animals that the ova enter the oviduct, and proceed toward the uterus. "Now from all these observations," he says (p. 45), "it is quite certain that the ova in mammalia, in the time of heat, no coition taking place, are detached from the ovary, enter the tube, and perish there; and that corpora lutea are formed in the ovaries *just as though coition and fecundation had taken place.*"

M. Négrier† has also published a work in which he advances somewhat similar opinions. His book, however, is written for the particular purpose of demonstrating the dependence of the menstrual function on certain periodical changes which take place in the ovary; *i. e.*, the successive maturation and rupture of Graafian vesicles. The spontaneous discharge of ova about the menstrual period is also alluded to by the author, but is not asserted in so distinct and positive a manner as the former proposition. Négrier does not, however, consider the yellow bodies as always produced by the rupture of Graafian vesicles, but supposes the yellow matter to be deposited between the coats of the vesicle at a stage of its development prior to its distension with fluid and final bursting; the yellow matter, together with the effused blood, becoming afterward rapidly absorbed. In this respect, he adopts the views of Sir Everard Home, and, like him, distinguishes two varieties of corpora lutea, *viz.*, the *ascending* and the *retrograde*; or those which are still entire, and in process of development, and those which have already become ruptured.

\* On the Maturation and Discharge of Ova, independent of Coition; Gilman's and Tellkemp's Translation, N. Y. 1847.

† Recherches Anatomiques et Physiologiques sur les Ovaires dans l'Espèce Humaine. Paris, 1840.

He imagines, also, with Home, the yellow matter to be a source of nutrition, or "a kind of placenta" for the germ.

Négrier recognizes three principal stages of the development of the Graafian vesicles (*travail vésiculaire*).

I. The formation of simple, small, globular vesicles, filled with serosity (*vésicules primaires*).

II. A deposit of gray matter between the walls, accompanied by a folding up of the vesicular parietes, and absorption of the contained fluid (*bourses grises*).

III. Enlargement of the whole vesicle, alteration of the colour from gray to yellow (*vésicules jaunes*, or corpora lutea of other writers), renewed secretion of serosity, distension and rupture of the vesicle. Respecting the connection of corpora lutea with impregnation, his opinions are the same as those of Bischoff. "I cannot, however," he says (*Avant-propos*, p. xv.), "share the opinion of Dr. Paterson, when he makes a distinction between the vesicular cicatrices, of true and false. They are all essentially cicatrices, consequent on the rupture of a perfectly developed vesicle, whether or not there has been any fecundation of the ovum which escaped from it; and, if the remains of these organs do not always bear a perfect resemblance to each other, it is because the rupture of the vesicle does not always take place in exactly the same manner; because the blood, effused from the open vessels, is variable in quantity; and because the delicate membranes of the vesicle are sometimes more extensively lacerated, the yellow matter being, in consequence, more readily dissolved by the extravasated blood, and disappearing as the clot becomes absorbed."

This account, by Négrier, of the development of the Graafian vesicle and formation of the corpus luteum is somewhat complicated, and is, moreover, entirely opposed to the views entertained by most other writers, as well as to those which will be advanced in the present memoir. M. Raciborski,\* in his work on Spontaneous Ovulation, or the "ponte périodique spontanée," adopts the more simple, as well as more probable theory that the corpus luteum is a formation which takes place altogether subsequently to the rupture of the vesicle. That part of his work which relates to ovulation is intended to establish the fact of the independent discharge of ova, and its connection, in the human female, with menstruation. His views, also, lead him to deny the existence of any distinguishing peculiarity in

\* M. A. Raciborski, de la Puberté and de l'Âge critique, Paris, 1844.

the corpus luteum of impregnation. "Some authors," he says (p. 511), "have attempted to show a distinction of true and false corpora lutea; the first of which, according to them, are met with only after a preceding conception. Notwithstanding all the efforts which have been made to establish this distinction, we are far from being prepared to acknowledge it. Numerous observations upon animals have convinced us that, whether the rupture of the follicles is, or is not, accompanied by coitus, or by fecundation, the appearance of the lesions which result is, in both cases, absolutely identical."

But the writer who has treated this subject in the most brilliant, decisive, and convincing manner is, beyond all others, M. Pouchet. His views were first advanced in a memoir published at Paris, in 1842, entitled "*Théorie Positive de la Fécondation.*" It appeared again, five years later, considerably amplified, and accompanied with elegant illustrations, under the following title: "*F. A. Pouchet, Théorie positive de l'ovulation spontanée, et de la fécondation des mammifères et de l'espèce humaine: Paris, 1847;*" a work which for comprehensiveness of design, brilliancy of style, and energy and conclusiveness of argumentation, has been rarely equalled among the productions of medical literature. In this work, M. Pouchet supports his views by the unconscious testimony of a multitude of earlier writers; by many observations made by himself, both on the human subject and on the lower animals; and by the analogies of function between various classes of animals, already known to exist, or for the first time demonstrated by himself. He establishes, in the course of his book, the following principal propositions:—

I. That in all classes of mammalia, ova are produced spontaneously in the ovaries.

II. That they are expelled spontaneously at regular intervals, independently of coition.

III. That in the human female they are so expelled at each menstrual period; this period corresponding to the rutting season of animals.

IV. That the ova are, and can be, fecundated only after their expulsion from the ovary; the various solid membranes, by which they are protected previous to this expulsion, opposing a complete obstacle to the access of the spermatic corpuscles, the actual contact of which is indispensable to the impregnation of the ovum.

V. That in all probability the part where fecundation usually takes place is the cavity of the uterus or the lower part of the Fallopian tube.

The fact announced in the fourth proposition, viz., that ova can be fecundated only after leaving the ovary, he considers as evident, not only from the interposition of the ovarian integuments between the ova and the spermatozoa, but also from the circumstance that contact with the seminal fluid does not produce the effect of impregnation on immature ova, but only on such as have arrived at a certain degree of development; and that this maturity and complete development of the unimpregnated ovum correspond in time precisely with its discharge from the Graafian vesicle.

The proofs of the third proposition, that the discharge of ova takes place in women at the menstrual period, are, with him, almost entirely drawn from analogy; as he gives but few direct observations on the human female bearing on the connection between ovulation and menstruation. These observations consist only of some microscopic observations on the menstrual fluid, which he shows to be entirely analogous to that discharged by mammalia during the season of heat. Strict analogical inferences, however, *may be* in some cases as reliable as direct observation; and, as the writer himself expresses it, "The difficulties which oppose themselves to observations on this subject, with regard to the human female, compel us here to rely upon analogy; but in this instance, the analogy is so evident that it is impossible not to acknowledge it."

M. Pouchet's views, however, regarding the corpus luteum are the same with those of Bischoff and Raciborski. "At the time," he says (p. 185), "that physiologists, influenced by entirely theoretical views, believed that ova were expelled only after fecundation, since corpora lutea were occasionally discovered either in women or in animals where no reproduction had taken place, some naturalists pretended that, in these cases, there had been no emission of ova, and that the corpora lutea in question were different from those which owed their origin to ova capable of impregnation. At the present day, this distinction, which never was anything more than a scholastic subtlety, can no longer have an existence."

"Since, by these labors, the fact of spontaneous ovulation has been demonstrated, it must now be superfluous to point out the futility of the distinction between true and false corpora lutea; they are all produced by the same processes; they have all discharged ova before presenting themselves under the aspect which they assume after that occurrence. And whether the ovule which they have expelled does or does not become fecundated, whether or not it under-

goes the transformation into an embryo, all have, nevertheless, the same form and the same structure."

*It is the object of the present paper to show that this conclusion of M. Pouchet is entirely erroneous; that the corpus luteum of pregnancy is different from the corpus luteum of menstruation; and that it may, under ordinary circumstances, be readily recognized and distinguished from it.*

In the following pages, however, I shall regard the five principal propositions of M. Pouchet as definitely established by the observations and arguments contained in his treatise; for probably nothing which could be here brought forward would add any very material weight to the evidences there presented.

Nevertheless, the reader will undoubtedly discover, among the following observations, many collateral proofs of the theory of spontaneous ovulation, to which it will not be necessary to direct his attention particularly.

It will readily be comprehended that the difference hereafter to be established between the corpus luteum of menstruation and that of pregnancy is not an essential or fundamental difference. Since the regular and periodical rupture of the Graafian vesicle and discharge of ova, at the time of menstruation, are here recognized, as well as the fact that corpora lutea are always formed in the ovaries as a consequence of such rupture and discharge, the differences alluded to must necessarily be owing only to variations in the subsequent changes in the ruptured vesicle; the most important parts in either case still remaining and preserving their original relations. The principal fact, therefore, to be established in the present memoir may perhaps be more accurately stated as follows: *That the presence of a fetus in the uterus induces certain modifications in the growth and progress of the corpus luteum, by which, during a certain period, we can be enabled to decide with certainty that pregnancy has existed; and that these modifications follow a regular course of progression and retrogression, by which we can estimate, in a proximate manner, the period to which pregnancy had advanced at the time of death.*

The importance of this subject, particularly in a medico-legal point of view, is too evident to require notice.

In order to present the necessary facts and arguments to the reader in the most convenient form, the following paper will be divided into three parts.



The *first* will embrace the history and description of the corpus luteum of menstruation.

The *second* will contain that of the corpus luteum of pregnancy, a comparison of the two, and an inquiry into the nature of the differences between them.

The *third* will contain some similar observations on the lower animals, with certain conclusions to be derived therefrom.



## PART I.

### CORPUS LUTEUM OF MENSTRUATION.

#### OBSERVATION I.



Appearance of the catamenia during the course of acute dysentery; death on the following day—A Graafian vesicle in one ovary recently ruptured and filled with blood—Other Graafian vesicles in active development—Remains of preceding corpora lutea—Decidua already nearly separated from the uterine surface.

M. K., æt. thirty-four, an inmate of the Insane Asylum at South Boston, was attacked with dysentery on Friday, August 9th, 1850, and died on the following Wednesday. She had been in the hospital about three months, suffering from a mild insanity, from which there were fair hopes of her recovery. The nurse stated, in general terms, that the patient's catamenia had been regular since her entrance. They made their appearance at about the regular period, on the day preceding death; so that Dr. Stedman, the physician of the asylum, was induced to hope for a favorable change in her disease. They ceased again, however, the same night or the following morning, and were not to be seen on the day of death.

The autopsy was performed on Wednesday, and the uterus and ovaries were taken out and given to me on the Friday following. There was no menstrual fluid seen in the vagina. There was much inflammatory alteration of the mucous membrane over nearly the whole extent of the large intestine.

The uterus was three inches long, two and a quarter broad, and one and three-sixteenths thick. On cutting open the organ, it was found to contain a flattened triangular mass, corresponding by its sides and angles to the shape of the uterine cavity, which it entirely occupied. It was of a dark red colour, but assumed a brighter hue after a few moments' exposure to the air. Its texture was soft and friable, while at the same time it showed some disposition to tear in strips, like coagulable lymph. It had also a finely granulated appearance.

The greatest thickness of the mass was at its lower extremity, where it approached the internal orifice of the cervix uteri. Here it was one-sixteenth of an inch thick. Superiorly, it terminated in a thin edge. The whole was very loosely adherent to the uterine parietes, from which it could be easily separated, leaving the uterine surface white, tolerably smooth, and perfectly firm. Under the microscope, it showed the following appearances: 1st. Blood-globules, rather pale, but not materially altered in size or shape. 2d. Columnar epithelium (from the oviducts). 3d. Irregularly roundish bodies, rather larger than blood-globules, and covered with very distinct granules. There were no other forms, besides these, discovered in its texture.

The right ovary was an inch and a half in length, of a yellowish-white colour, firm and condensed in texture, and much puckered by cicatrices. Near its uterine extremity, and on its posterior aspect, there was a rounded prominence, about as large as the end of the little finger. This prominence, or tumour, was considerably reddened externally. It was soft and yielding, giving to the fingers quite a distinct sense of fluctuation. The ovarian coats were unnaturally thin all over the prominence, and at one spot the tunica albuginea was wanting; and its place occupied only by a thin, smooth membrane (peritoneum), through which appeared the dark red colour of the interior. This spot was nearly semicircular in shape, and rather less than a quarter of an inch long, by a little over an eighth of an inch broad. Its edges were quite sharply defined, looking as if the tunica albuginea had been ruptured. About its centre was a very minute perforation, which allowed a little dark blood to flow out on compressing the tumour, but which was too small to be distinctly seen otherwise.

On dividing the ovary longitudinally, at the point of rupture, a cavity was opened, situated immediately beneath, of an ovoid shape, and measuring five-eighths of an inch in its long diameter. (See Plate I, Fig. 1.) It contained seven or eight drops of very dark, thickish blood, and a very dark, almost black coagulum. The coagulum lay loose in the cavity, except just at the point of rupture, where it was slightly adherent to the investing membrane. The walls of the cavity were composed of a single, firm, semi-transparent, vascular membrane, with a smooth internal surface, which could be readily stripped off entire from the cut surface of the ovary. There was no distinct membrane external to this, though irregular, vascular-looking strips of cellular tissue could still be raised by the forceps.

There was no yellow matter anywhere, and no puckering of the membrane.

There were two other well-developed Graafian vesicles in this ovary filled with clear fluid; one of them nearly as large as the bloody cavity just described.

The right oviduct was free and pervious throughout. It contained, particularly toward its ovarian extremity, some thick whitish fluid, which under the microscope showed only nucleated columnar epithelium.

The left ovary was of about the same size as the right, and similarly seamed and puckered. It had upon its surface two Graafian vesicles, filled with clear fluid; the larger of them about the size of a small hazelnut. It also contained one or two soft, granulous-looking, thin, compressed, yellow bodies, the remains of former menstruations. These were entirely similar, both in their gross and microscopic characters, to the other retrograde corpora lutea, hereafter to be described.

The left oviduct was pervious throughout, and contained white fluid like that in the right. There was nothing else remarkable about the uterine organs.

This case has several points of interest. In the first place, the condition of the patient, and the circumstances under which she was living, are such as almost to preclude the idea of any sexual intercourse having taken place. Probably we should never be able to meet with a case where, in the human female, the rupture of a Graafian vesicle, independent of coition, could be more certainly established than in the present instance.

It is probable that the patient's illness had not caused any very great disturbance in the periodical return of the menstrual function, since it was stated that it had heretofore been regular, and that its return at that time was only "a little" in advance of the expected period. Still, as the menstrual flow lasted only during one day, it is impossible to say whether this corresponded to the earlier or later part of its regular period of duration. The persistence of the ovarian function, notwithstanding the grave disease under which the patient was laboring; the fact that the vesicle was burst, and filled with blood, but had not yet commenced its transformation into a corpus luteum; and the coincidence in time between the rupture of the vesicle and the separation of a decidua from the internal surface of the uterus, are all circumstances which deserved particular notice.

## OBSERVATION II.

Death from cholera during menstruation—Excessive hemorrhage into a Graafian vesicle—Decidua (probably) expelled—Old corpora lutea in the opposite ovary.

J. C., a married woman, thirty-eight years of age, died at the Cholera Hospital in Boston, Sept. 3d, 1849, after an illness of twenty hours. Her general health was stated to have been good.

At the autopsy, the vagina was smeared with a dingy red secretion. The os uteri was rather open, and purplish in colour. The cavity of the cervix contained a little adhesive secretion. The uterus, generally, was of natural appearance, and measured three inches in length, two in breadth, and one in thickness. Its internal surface was quite smooth, firm, and pale, without any appearance like the formation of a decidua; but was smeared with a reddish fluid, like that of menstruation.

The right ovary was enlarged to six or eight times its natural size. It was ovoid in shape, and two and a quarter inches long; the other measurements in proportion. It had the aspect and feel of a serous cyst, capable of containing one ounce of fluid; but the red colour of its contents showed through at the thinner part of its walls. It was filled with a dark, tolerably firm, recent-looking bloody clot, intersected by one or two very delicate enclosed (false) membranes. The whole clot could be easily turned out, leaving a very red smooth lining membrane, with several spots of complete ecchymosis on its surface. The clot occupied nearly the whole of the organ; the proper structure of the ovary being reduced to a very small proportion of the whole.

The right oviduct was somewhat convoluted. Its ovarian extremity was closed and adherent to the ovary. It could, however, be easily dissected off, without opening the cavity of either. The oviduct was distended so as to contain a drachm, or more, of thinnish, dingy-red fluid similar to that in the cavity of the uterus. Its internal surface was natural, and it was pervious throughout, except at its ovarian extremity.

The left ovary was one and three-quarters of an inch long. It was of a natural form and colour, and had several cicatrices on its surface. Internally, it contained one or two small, old-looking cor-

pora lutea. The left oviduct was free from adhesions. Its internal surface was smeared with a small quantity of whitish fluid secretion.

The amount of hemorrhage in this case was so great as perhaps almost to constitute a morbid appearance. It shows, however, the connection between the ovarian hemorrhage and menstruation, and the expulsion of the decidua ; which, a comparison with other cases will show, had probably been recently thrown off, leaving the uterine surface smooth and firm. It should also be remembered that the patient's "general health" was said to be good ; so that the deviation from a normal condition was not probably very essential.

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### OBSERVATION III.

Sudden death in consequence of an extensive burn—A Graafian vesicle in each ovary filled with blood, and the internal surface of the uterus soft and shaggy.

M. M., a remarkably healthy-looking and well developed young woman, unmarried, twenty years of age, died at the Mass. Gen. Hospital, January 29th, 1848. Three days before, she had suffered a very extensive burn in consequence of the bursting of a camphene lamp, by which the skin was more or less completely destroyed over the greater part of her face, neck, body, and arms. She suffered but little pain after the first day, and finally died collapsed, and partially comatose. No information was obtained regarding her menstruation.

At the autopsy, it was found that the inner surface of the larynx was extensively scorched, and œdematous. There was also some pneumonia of the right lung. The uterus was of natural size : three inches long, by two broad. Its mouth was transverse, and sufficiently open to admit the end of the little finger. The cavity of the uterus was filled with an abundant reddish, very tenacious secretion. Its internal surface was soft, and somewhat shaggy. Both Fallopian tubes, easily laid open through their whole extent, contained a thick, yellowish, opaque fluid.

Both ovaries were remarkably large. The left had on its surface an irregularly oval spot, three-fourths by three-eighths of an inch in size, where the investing membranes were depressed, thin, and red ; very distinct from the remainder of the surface, which had its usual thick, yellow, opaque appearance. More than half the substance of

the ovary was occupied by a roundish cavity, situated immediately beneath the above-mentioned spot, and filled with a firm, pretty adherent coagulum, dark red internally, mere yellowish externally. The lining membrane of the cavity, immediately external to the coagulum, was of a dull red and brownish colour, and opaque. It was moderately adherent, but could be raised and separated entire. External to this were cellular layers, which could only be raised in strips, the outermost of which were intimately connected with the ovarian tissue. The opposite ovary had a similar spot on its surface, and a bloody cavity underneath. The coagulum here was rather less firm than the other, and had a fresher appearance. The surrounding membrane could not be so easily traced.

The history of this case being somewhat imperfect, it does not afford any direct proof of the connection between ovarian hemorrhage and menstruation. A comparison with other observations, however, makes it probable that menstruation had either just terminated, or was suppressed by the accident which resulted in death. The case is somewhat remarkable, like the last, for the large amount of blood effused within the Graafian vesicle, and shows, moreover, the connection of the ovarian hemorrhage with the softening of the uterine surface.

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#### OBSERVATION IV.

Rapid death from cholera—A Graafian vesicle filled with blood, and just commencing the transformation into a corpus luteum—Softening of the uterine surface.

E. D., unmarried, thirty-six years of age, died at the Cholera Hospital in Boston, Sept. 11th, 1849, after an illness of eighteen hours. No information was obtained regarding the patient's menstruation, but she was stated to have been in her "usual health" until the period of attack.

The vagina was smeared with a moderate quantity of the ordinary starchy secretion of cholera. The uterus measured three and three-eighths inches in length, one and seven-eighths in breadth, and one and a quarter in thickness. It was firm and pale anteriorly, but posteriorly had rather a tumefied appearance, and in its posterior wall it contained a fibrous tumour, a quarter of an inch in diameter,



near which the uterine substance was somewhat reddened and softened. Elsewhere it was natural. The os uteri was small and round, the cervix pale, firm, and empty. The internal surface of the body of the organ was much softened and reddened to the depth of three-sixteenths of an inch. It was, in fact, converted for that depth into a dark purplish red, soft, shaggy coat, in which numerous slender, wavy fibres were distinctly visible, projecting toward the interior. This reddened coat was sufficiently tender to be scraped off with considerable readiness by the edge of the knife, leaving the uterine surface pale, and somewhat uneven. It was confined to the body of the organ, and did not descend at all into its neck.

The right ovary was one and seven-eighth inches in length. Nearly half of it was occupied by a loose, fluctuating tumour, having much the appearance of a serous cyst, only the red colour of its contents showed through. It was roundish and bulging, and at its most prominent part showed a small abraded spot, but nothing like a well-marked cicatrix. Internally, it presented a cavity which was filled partly with a thin bloody fluid, and partly with a tolerably firm, adherent coagulum, from which the red colouring matter had not yet been completely absorbed. The walls of the cavity consisted apparently, at its bulging extremity, of the thinned and distended coats of the ovary, but at its deeper part of a yellowish, well-defined layer of moderately firm consistency, and irregularly folded and convoluted, like the convolutions of the brain. This yellow layer had a thickness at the deepest part of the tumour, of one-sixteenth of an inch; but it gradually became thinner as it approached the surface, until it appeared to blend with the coats of the ovary.

The left ovary, one and a quarter inches long, contained three or four moderately developed Graafian vesicles. There was nothing remarkable about either oviduct.

Fig. 1.



Commencement of formation of the corpus luteum.

## OBSERVATION V.

Corpus luteum of menstruation of about two weeks' date—Another, in the opposite ovary, in a retrograde condition—Softening of the uterine surface.

M. H., a servant girl, aged twenty-two, of a plump and healthy aspect, died at the Cholera Hospital, in Boston, Sept. 16th, 1849, after an illness of but little over thirty hours. In the recorded history of her case, it was stated that she had "menstruated" two weeks previously, but no account was obtained of the exact time at which the flow commenced or terminated.

At the autopsy, the vagina was found smeared with a starchy secretion. The os uteri was rather open. The cavity of the cervix contained a very little glutinous secretion, and its internal surface showed one or two distended follicles beneath the lining membrane. The body of the uterus was empty and of natural appearance; firm and whitish. Its internal surface was softened to the depth of three-sixteenths of an inch, and converted into a loose, vascular, shaggy texture, in which fine zigzag vessels, intermixed with whitish fibres, were distinctly visible, forming very much the same appearance as that described in the preceding observation. The uterus measured three inches in length, one in thickness, and one and three-quarters in breadth.

The left ovary, one and three-quarter inches in length, contained at one extremity a roundish, ovoid tumour, measuring five-eighths of an inch in its long diameter. It was composed of a light-yellow external layer, strongly folded and convoluted, and enclosing a fibrinous, semi-translucent coagulum, stained with some remains of the colouring matter.

The yellow wall of this corpus luteum was invested by a delicate external membrane, with which it could be enucleated entire from the ovary. Its texture was friable and granular. On superficial examination, it appeared to contain some bundles of fine vessels, proceeding from without inward; but on closer inspection they were seen to exist only in the interstices between the convolutions, where they had been accidentally exposed in making the section; in the same manner as the vessels of the pia mater may be exposed, dipping down between the convolutions of the brain. The substance of the yellow wall itself contained no vessels.

The tumour formed by this corpus luteum had just firmness sufficient to allow its contour to be felt through the ovarian texture; but it

had very little resistance, and might easily have been crushed between the thumb and finger. Before being cut open, it even gave an indistinct and deceptive sense of fluctuation.

The following represents the ovary, of natural size, cut open longitudinally.

Fig. 2.



Corpus luteum of menstruation  
about two weeks old.

Fig. 3.



Corpus luteum of menstruation of  
about six weeks.

The opposite ovary was of natural size and appearance. It contained at one spot, immediately beneath its surface, a small flattened cavity, a quarter of an inch in diameter. The cavity had no bloody contents, but was surrounded by a thin wall, of a dull yellowish colour, which showed indistinct appearances of being more or less convoluted. This wall was surrounded by a thin delicate membrane, with which, like the other, it could be enucleated from the substance of the ovary. A drawing of it is given above (Fig. 3). •

The ovaries also contain several Graafian vesicles in active development. Both oviducts were in a natural condition, and contained only a little whitish fluid.

## OBSERVATION VI.

Corpus luteum of menstruation, three weeks from the termination of the menstrual period—at its maximum of development—Five others, in different stages of retrogression—Uterine surface soft, but pale.

L. E. B., a factory operative at Lowell, unmarried, twenty years of age, was attacked with hæmoptysis on Friday, June 28th, 1850, at

eight P. M., while walking in the street, and died the next morning at four. The uterus and ovaries were taken out at the autopsy, and sent to me by Dr. J. C. Dalton, Sr., by whom the following particulars, relating to menstruation, &c., were also ascertained.

The girl had been in perfectly good health for many months, and had menstruated for the last time just three weeks previous to her death. This last fact was ascertained of the patient's landlady, who had inquired particularly concerning it of the girl's sisters, immediately after her death. The sisters worked in the same mill, and boarded in the same house. It was undoubtedly meant that the girl had *ceased* menstruating just three weeks before; since it was also remarked that she was then "within a week of her time." The body generally "appeared somewhat exsanguious, and the lungs very much engorged. No tubercles, but one old ulcer, as large as a shagbark, lined with false membrane, at the right apex; near which was a strong pleuritic adhesion. Other thoracic and abdominal organs healthy."

The uterus was empty, and of natural appearance externally. Its internal surface was pale, but softened to the depth of about a quarter of an inch, exhibiting distinctly the velvety, shaggy appearance already described.

The right ovary was one inch and seven-eighths in length. Its surface was generally smooth, and pale yellowish in colour, and showed only here and there a very few fine superficial vessels. Its outer extremity presented a rounded tumour, about the size of the end of the finger, imbedded in the substance of the ovary, but projecting slightly from its posterior surface (Plate I. Fig. 2). It was globular in shape, and had but little solidity, feeling as if it might easily be crushed between the thumb and finger. The surface of the ovary, over the tumor, was quite vascular, showing many red and blue vessels. At about its most prominent part was a cicatrix; *i. e.*, a small oval spot, very slightly depressed, about one-twentieth of an inch in length, where the tunica albuginea was entirely wanting, and its place supplied by a thin, delicate, transparent membrane, which allowed the pale reddish colour of the contents of the tumour to show through.

On making a longitudinal section of the organ, through the cicatrix, the corpus luteum was exposed (Plate I. Fig. 3, *a*). It was three-quarters of an inch in its long diameter, and nearly one-half an inch in depth. It consisted of a thin, pale, reddish-yellow, irregularly convoluted wall, enclosing a solid, semi-transparent, fibrinous coagulum, which showed in various parts remains of the red colour-

ing matter of the blood. There was no empty cavity. The wall was thickest at the deepest part of the tumour, and grew gradually thinner as it approached the surface and the situation of the external cicatrix, where finally it was entirely wanting; showing conclusively that the rupture of the Graafian vesicle had taken place at this spot.

The relative proportions of the convoluted wall and its contents are represented in the drawing. The wall itself was not lined by any membrane, but was in immediate contact with the fibrinous coagulum. Externally, it was invested by a thin, semi-transparent, vascular membrane, with which it could be readily enucleated from the substance of the ovary, leaving a smooth and somewhat vascular surface of condensed cellular tissue. This investing membrane was intimately connected with the substance of the yellow wall, and could not readily be separated from it; so that, when raised in strips, portions of the wall adhered to it. The interstices of the convolutions were vascular, but no vessels could be detected in the substance of the yellow wall itself.

Toward the uterine extremity of the ovary, there was another yellow body (Plate I. Fig. 3, b), much smaller than the first, situated immediately beneath a minute transparent cicatrix on the surface, which was surrounded by a slight vascularity. The colour of this body was a much more decided yellow than that of the first. It appeared to consist of a wall, the opposite sides of which were nearly or quite in contact, owing to the absorption of the contained coagulum. The wall also showed some indications of a convoluted arrangement; but the whole body was so small, and its texture so friable, that it was difficult to establish this point distinctly.

At a short distance was situated another yellow body, similar in character to that last described, only much smaller.

The left ovary was one inch and five-eighths long. It showed on its surface several cicatrices, both shallow and depressed, and contained three *very small*, obsolete yellow bodies, like those described as found in the right ovary.

Both ovaries contained many Graafian vesicles, in different stages of active development, but neither showed anything else at all resembling a corpus luteum.

Both oviducts were free and natural in appearance throughout.

## OBSERVATION VII.

Corpus luteum of menstruation of about the same date as the preceding—Softening of the uterine surface.

E. B., a widow, thirty years of age, died at the Cholera Hospital in Boston, August 20th, 1849, after an illness of ten and a half hours. No information was obtained regarding her menstruation, but she was "as well as usual" till the period of her attack. The abdomen, externally, showed many scars of pregnancy.

The uterus was somewhat "bombée" posteriorly, and had rather a softish feel. It was empty. Its internal surface was much softened and reddened to the depth of three-sixteenths of an inch, having undergone the same change already described in previous observations. The internal surface of the cervix uteri was pale, and had but little of the adhesive secretion in its cavity; but one or two follicles, distended with this secretion, could be seen beneath its mucous membrane. The uterus measured three and a quarter inches in length, and two and a quarter in breadth. (The subject was large and stout.)

The right ovary was one inch and three-eighths long; generally

white and natural in appearance. One end of it was occupied by an ovoid tumour, not very firm to the touch, the dull reddish colour of which showed through the integuments of the ovary. A section of the ovary showed the tumour to be three-quarters of an inch long, by nearly half an inch deep. It consisted, like the others, of a yellow convoluted wall, which enveloped a homogeneous, opaline, greenish, fibrinous-looking coagulum, which still presented, in spots, some traces of the colouring matter of the blood.

Fig. 4.



Corpus luteum of menstruation of about three weeks.

The point of rupture is not seen in this drawing; probably because, in making the section, sufficient care was not taken to cut through the cicatrix.

## OBSERVATION VIII.

Death during the menstrual period—Corpus luteum of the last menstruation commencing to diminish in size—Graafian vesicle not yet burst—Decidua just separated from the uterine surface.

C. M., a married woman, thirty years of age, died at the Cholera Hospital in Boston, August 23d, 1849, after an illness of four days. She was said to have had her usual health till the time of the attack.

The uterus was rather large, particularly in proportion to the size of the patient, who was small and slightly built. It measured three and three-eighths inches in length, two and a half in breadth, and one and a half in thickness. It was much bulging posteriorly, and had altogether a tense, stiff, swollen aspect and feel. The os uteri was widely open. The cavity of the cervix was filled with an abundance of tough, tenacious secretion, strongly coloured with blood. The vagina, also, and external organs were smeared with a bloody fluid.

The internal surface of the body of the uterus was quite pale and smooth, without any appearance of the softening elsewhere described; but its cavity contained a flattened triangular mass, like that mentioned in Observation I., of a reddish-gray colour and loose texture, having no appearance of an organized structure, nor any attachment to the walls of the uterus. It had evidently taken its shape from that of the uterine cavity, its two upper angles corresponding to the orifices of the oviducts. Its longitudinal diameter was a little over one inch; its transverse, at its widest part, something less.

The left ovary, one and a half inches in length, had a natural colour and appearance externally. At the uterine extremity of the organ was a spot where the integuments were thinned, and the reddish colour of the corpus between showed through. The tumour was ovoid in shape, but had very little firmness, or resistance to the touch. It consisted of a thin, yellow, very irregular, convoluted wall, and an internal greenish, semi-transparent, fibrinous clot, stained with some remains of red colouring matter. There

Fig. 5.



Corpus luteum of menstruation of nearly four weeks.

was no strongly-marked cicatrix on the surface of the ovary. The accompanying drawing (Fig. 5) represents the ovary and corpus luteum, of the natural size. The left oviduct was empty and pale internally.

The right ovary, of about the same size as the left, presented several Graafian vesicles, moderately developed. The right oviduct contained, in its uterine half, a considerable amount of thickish, bloody fluid; otherwise it was natural.

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### OBSERVATION IX.

Death just at the termination of a menstrual period—A Graafian vesicle prominent, and on the point of bursting—Corpus luteum of the preceding menstruation, in a retrograde condition—Seven others, quite atrophied and obsolete—Uterine surface pale, but soft.

MRS. A., a widow, forty-five years of age, a patient of Dr. W. H. Thayer, was attacked suddenly with apoplexy, Oct. 14th, 1850, at 5 P. M.; and, after lying insensible for sixteen hours, died on the following morning. Mrs. A.'s youngest child was about twelve years of age. Her husband had been dead ten years. Her maid-servant, an intelligent girl, reported to Dr. Thayer that Mrs. A.'s catamenia had been regular at intervals of four weeks, from commencement to commencement; and that they always continued a week, accompanied with much pain in the pelvic region, sometimes so great as to oblige her to keep her bed for a day. Her last catamenial period closed on Sunday the 13th, the day before her attack, as Mrs. A. had herself told her. She was in general well acquainted with the course of her mistress's catamenia, as she washed her linen, and was also a kind of confidential servant.

At the autopsy, Oct. 16, twenty-five hours after death, a hemorrhage of about three ounces was found in the substance of the right hemisphere of the brain, and another, much smaller, in the right optic thalamus. The cerebral substance was much softened in the immediate neighbourhood of each coagulum. There was also considerable hypertrophy of the left ventricle of the heart, but the other organs were healthy. The stomach contained much undigested food.

The uterus was quite large, measuring three and a half inches in length, and two and a quarter in its transverse diameter. Its walls



were proportionably thick, but natural in texture. It was empty. Its internal surface was rather pale, but quite soft, shaggy, and velvety in appearance. The os uteri was transverse, wide, and much fissured.

The left ovary was an inch and five-eighths long. It contained two large and somewhat prominent Graafian vesicles, with clear fluid contents: One of them was particularly distended and prominent; being covered, over a considerable part of its surface, by peritoneum alone. On the anterior surface of the organ was an irregularly oval spot, three-eighths of an inch long, where the tunica albuginea was wanting. Immediately beneath was a corpus luteum, the bright yellow colour of which showed through the peritoneal coat. There was also a black speck upon its surface, which marked the spot where the rupture of the vesicle had taken place. On making a section of the ovary, through this black spot, the corpus luteum was exposed, of a somewhat flattened, oval shape, three-eighths of an inch in length, and a little over a quarter of an inch in depth. (Plate I. Fig. 4.) It consisted, like the others, of a bright yellow, pulpy, friable wall, thickest at its deepest part, and gradually thinning off toward the situation of the rupture; strongly folded upon itself, and destitute of vessels. It enclosed a little, very dark, moderately firm coagulum, which was easily removed, having no organic connection with the yellow wall. The wall itself was not lined by any membrane, but was in immediate contact with the coagulum. When put upon the stretch, it was not more than one-twentieth of an inch in thickness; but, when allowed to remain folded up, appeared somewhat thicker. It could easily be enucleated entire, and externally had the same relations to the investing membrane and the substance of the ovary as in the preceding cases.

The same ovary contained two other old corpora lutea, one of them about a quarter part the size of the first, the other still smaller. They were both, in their general characters, similar to the first. The larger had also a small black spot on its surface, marking the situation of the rupture; and a section being made at a little distance from this spot, the foldings of the wall were distinctly seen to radiate from it.

The right ovary was one and three-quarters of an inch long. Its section discovered a yellow body, about a quarter of an inch in length, much flattened, and containing a little very dark blood. There were also four others, perfectly distinguishable, but diminishing successively in size; all superficially situated beneath shallow

or moderately depressed cicatrices. The two smallest, alone, contained no noticeable remains of blood. They were all similar in structure, but the smaller were whiter, and of a less decided yellow, than the larger. There were no other remarkable appearances.

Both oviducts were quite natural. They contained only a little opaque, whitish secretion, which, under the microscope, showed an abundance of ciliated epithelium.

Everything makes it probable that, in this instance, the largest corpus luteum was the result of the last menstruation but one, and that the most prominent vesicle on the left ovary was just upon the point of bursting when the patient suffered her attack of apoplexy.

So far this case, together with the preceding, would go to sustain the opinion of Pouchet and Raciborski, that the ovum is discharged in the human female, not *during*, but *at the termination* of, the menstrual period.

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## OBSERVATION X.

Death from inflammation of the brain of several weeks' standing—Corpus luteum of menstruation thirty days after the termination of the menstrual period—Three others still more obsolete—No prominent Graafian vesicles—Uterine surface only a little softened.

M. A., a married woman, twenty-nine years of age, who had had one child four years ago, entered the Almshouse Hospital at South Boston, June 10th, 1850, suffering from symptoms resembling chorea. They consisted in a capricious, semi-involuntary, twisting motion of the right arm and hand, and some disposition to a drawing up of the left leg. There was also an almost constant, slow winking motion of the right eyelid, accompanied by a sinister leering expression of the countenance, as if the patient were partially idiotic or hysterical. The intelligence was rather dull, but otherwise not much altered.

She was treated with antimonials, low diet, and blisters to the back of the neck; afterwards by carbonate of iron and full diet.

Under this treatment she improved much, and on the 29th of June, being to all appearance well, was discharged from the Hospital and sent to the Almshouse. Two days afterward, however, she returned, suffering under a fresh attack, much more severe than

the former. This time she had lost much of her muscular power; and lay nearly prone on the floor of the ward, apparently unable to rise, and very stupid. After much urging, she managed to raise herself from the ground with the assistance of a chair, but had great difficulty in doing so. There was some paralysis of the left side, and a want of control over the muscles of the right. She was treated with purgatives and counter-irritation to the head and spine, but sunk into a deeply typhoid condition, and died on the 12th of July.

The nurse reported that the patient was menstruating at the time of her first entrance into the hospital, and continued to do so June 10th and 11th. On the 12th, the discharge returned slightly, and then finally ceased. The nurse was positive that she had had no menstruation since, as she must have known it, if such had been the case. There was found much inflammatory softening of the right hemisphere of the brain, and of the right corpus striatum; some also of the right optic thalamus and of the left hemisphere.

The uterus, of about the normal size, was somewhat retroverted, and inclined to the left side of the pelvis, where it was confined by numerous old, organized, bridge-shaped adhesions. It was empty. Its internal surface was quite vascular and a little pulpy, but much less so than in some of the preceding observations, as the pulpy portion at its thickest part did not exceed one-sixteenth of an inch.

The right ovary was one inch in length; white, firm, and covered with cicatrices. It contained two yellow bodies. (Plate I. Fig. 5). The larger was flattened from without inward, and contained within the yellow wall an appreciable amount of reddish fibrin which could be easily separated from its cavity. This body was a little over a quarter of an inch in its long diameter. It was situated immediately beneath a strongly depressed cicatrix on the surface of the ovary. On very minute examination traces of the convoluted arrangement of its walls were visible.

The second body was irregularly globular in shape, and much smaller than the first. Its centre was occupied by a radiated cicatrix, which no longer contained any noticeable amount of coagulum. The right ovary also contained one more very minute yellow body, too small to show any definite structure. There was also one more in the left ovary, but nothing else in either that presented any appearance like that of a corpus luteum.

There were but very few Graafian vesicles to be seen, and these were small and of an inactive appearance.

The right oviduct was much convoluted, and confined by adhesions. The fimbriated extremity was entirely adherent to the ovary, enclosing an oval space on the surface of the organ five-eighths of an inch long. The oviduct was somewhat distended, and contained about half a drachm of thickish, brownish-red fluid, approaching to bistre in its colour. The internal surface was vascular, and stained by the brownish fluid; otherwise natural. The left oviduct was adherent like the right, but empty and collapsed. It was impervious in two or three spots, toward its uterine extremity. But the right was pervious throughout.

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### OBSERVATION XI.

Absence of catamenia for over two months—Corpus luteum of last period very small—Four others, quite obsolete—No softening of uterine surface.

M. S., unmarried, twenty-three years of age, died at the Massachusetts General Hospital, Aug. 26th, 1850, of tubercular meningitis.

She entered the house Aug. 18th, at which time her intelligence was so much affected, that she was unable to give any account of herself. Her sister, however, reported that she had had no catamenia for two months, and none appeared while she was in the hospital; making, in all, a period of two months and eight days that the catamenia had been absent.

At the autopsy, the substance of the brain was found somewhat softened, with a rather copious effusion of serum into its cavities, and an abundance of minute, whitish, opaque (tuberculous) grains, scattered through the meshes of the pia mater between the convolutions; more particularly at the base of the brain. The pleuræ were also sprinkled with tuberculous granulations, without the existence of any considerable collection in the pulmonary substance. The liver and spleen also showed an abundance of similar tubercles in their interior.

The uterus was rather small and firm. Its neck was conical, and its mouth small and perfectly circular. The cavity of the organ contained a moderate quantity of transparent mucus, slightly tinged with red. A part of its internal surface was rather vascular, but it was everywhere smooth and firm, and of its natural consistency.

The right ovary was one and a half inches in length, and of the ordinary yellowish-white colour. Its surface showed several shallow, bluish cicatrices, none of which had a very recent appearance. The ovary contained four old corpora lutea, the largest of which was three-sixteenths of an inch in diameter, and entirely similar to that described in the preceding observation, except for being smaller. (Plate II. Fig. 1.) It consisted of a delicate, flattened, thin, yellowish-white wall, destitute of vessels, and enclosing a thin fibrinous coagulum, which was still somewhat coloured with blood. Traces of a convoluted arrangement of the yellow wall were quite evident on close inspection. It was neither lined nor surrounded by any membrane that could be demonstrated, but was immediately in contact with the fibrinous clot internally, and externally appeared closely connected with the ovarian tissue.

The remaining yellow bodies in the ovaries were smaller, but otherwise similar. The left ovary also contained one, very small. Both ovaries contained many Graafian vesicles, varying in size from a quarter of an inch or less to three-eighths of an inch in diameter.

Both oviducts were free and pervious throughout. They contained a moderate quantity of thick, whitish, opaque fluid, like that met with in Observation I. There was nothing else remarkable.

From the foregoing observations we can deduce a more or less complete history of the corpus luteum. In the first place, it is certain that, in connection with the appearance of the menstrual period, a Graafian vesicle arrives at maturity, protrudes from the surface of the ovary, ruptures, and becomes filled with blood. Sometimes this process takes place in each ovary at the same period. It will even hereafter be seen that two vesicles may become ruptured simultaneously in the same ovary. During the final enlargement of the vesicle, and its protrusion from the ovarian surface, it strongly distends the albugineous coat, the fibres of which become separated and pushed aside to such a degree that this tunic is at last wanting over a spot of considerable size; and the vesicle is covered, at its most prominent part, by peritoneum alone; so that, at the time of the rupture, it is only the peritoneal coat which becomes lacerated.

The precise period, during the catamenial flow, at which this rupture takes place, does not seem, as yet, to be definitely ascertained. The inherent difficulty of making these observations in the human subject, and the rarity of opportunities for examining the ovaries of healthy women, who have died by violence or after a rapid illness,

oppose great obstacles to our arriving at a correct conclusion on this subject. The difficulty, too, of estimating the influence which even a short illness may have had on the exact period of rupture is so great, that many further observations will be necessary, in order to determine with certainty so nice a point. Perhaps this period is not, even in the ordinary course of nature, invariable; and if we are to rely on such information as we already possess, this would seem to be the most probable supposition. Bischoff,\* Pouchet,† and Raciborski‡ all agree that the ovum is discharged regularly, only at the *termination* of the menstrual period, and this opinion is certainly sustained by Observations VIII. and IX. of the present paper. Dr. Robert Lee§ also relates the case of a woman who died "while menstruating." The uterus and oviducts were lined with menstrual fluid, and on one ovary was a large, projecting, Graafian vesicle, having over it an abrasion of the peritoneum. On the other hand, there are not wanting abundant observations of Graafian vesicles ruptured *during* the menstrual flow. Such an observation by Cruikshank, recorded in the *Philosophical Transactions*, 1797, has already been alluded to. Dr. Lee|| gives an instance of a Graafian vesicle filled with blood, death having taken place during menstruation, and cites other similar ones from Gendrin. Bischoff¶ states that he has opened the bodies of four females, dead suddenly during menstruation. Three of them presented, in one of the ovaries, a vesicle burst and filled with blood; in the fourth, there was remarked only a vesicle not yet ruptured. It would therefore appear that the rupture takes place sometimes earlier and sometimes later, but that it always has an intimate relation with the appearance of the catamenia.

Another remarkable variation in the appearance of the vesicle at this period depends upon its larger or smaller size at the time of rupture, and the greater or smaller quantity of blood effused. In Observation I., this quantity was very moderate, as may be seen by reference to the drawing. In Observation III., it was much larger; and in Observation II., it was so excessive as to be estimated at about one ounce. This variation may probably be explained by the difference in the age of the subjects, and in the condition of the vascular system generally, whether of full health, of plethora, or of deficiency of vascular action. It also depends, without doubt, to a certain ex-

\* Op. cit. p. 52.

† Ibid. p. 244.

‡ Ibid. p. 414.

§ London Med. Gazette, Nov. 5th, 1842.

¶ Ibid.

|| Op. cit. p. 50.

tent, on the greater or less activity of the uterine organs in particular. Whatever may be its cause, it is, perhaps, not more remarkable than the differences which are observed in the size of the ovaries themselves, or of the other internal organs. It will hereafter be seen, in another division of this paper, that the size of the vesicles, even in the same ovary, is not always the same at the period of their full development, those which are matured and ruptured not always being the largest.

Another point which still remains somewhat doubtful relates to the period at which the hemorrhage takes place; whether it occurs before or after the time of rupture. From some of the accompanying observations, it would seem probable that it succeeds to, and is a consequence of, the bursting of the vesicle; since we have seen the vesicle, at a late period, very large and prominent, with its contents still clear and unmixed with blood. Pouchet,\* however, states that the ovum is pushed from the bottom of the vesicle toward the surface by a gradual hemorrhage beneath its inner membrane (*membrana granulosa*); and that the vesicle is, in this way, already filled with blood, before the final rupture takes place. This matter must be considered as still uncertain. Pouchet's opinion may, no doubt, receive support from some observations in which the vesicle has been found filled with blood without presenting any lesion of its peritoneal coat. It must, however, be remarked that, though the albugineous tunic remains for a long time deficient at the spot where the protrusion of the vesicle took place, yet the peritoneal coat is very rapidly reproduced; consequently, no perforation might be visible in this membrane, only a very short time after the occurrence of the rupture.

The rupture of a Graafian vesicle, with hemorrhagic effusion into its cavity, as accompaniments of menstruation, have been recognized by some writers, who are, nevertheless, unwilling to acknowledge that an ovum is at the same time discharged. Dr. Robert Lee† considers it probable that "all the phenomena of menstruation depend on, or are connected with, some peculiar changes in the Graafian vesicles, in consequence of which an opening is formed in their peritoneal and proper coats." Notwithstanding this, he denies explicitly that any ovum passes from the ovarium during menstruation, but appears to consider this process, when it does occur, as excited by the stimulus of the seminal fluid. Dr. Patterson‡ entertains a similar

\* Page 138.

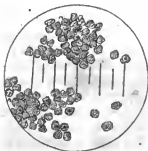
† *Cyclop. Pract. Med.* iii. 444.

‡ *Edinburgh Med. and Surg. Journal*, Jan. 1840.

opinion, except that he does not think the rupture of the vesicle at the time of menstruation a constant, but only an occasional occurrence. This, indeed, is a matter in regard to which we must be content, at present, to rely on other evidences than direct observation; for I am not aware that any one has yet seen, in the human female, an unimpregnated ovum in the oviduct, and recently discharged from a vesicle. It appears, however, contrary to all known physiological analogies to suppose that the vesicles should be ruptured for any other purpose than that of discharging their contents. It is conceded on all hands that the human ovum, as well as that of the lower animals, exists in the vesicle previously to impregnation. Thus in a young girl, ten years of age, dead at the Female Orphan Asylum, January 9th, 1851, of perforation of the stomach, I was able to discover three ova in one ovary, and one in the other. No doubt many more might have been found, but that the vesicles were very friable, and many became ruptured in the process of separating them from the ovary. The vesicles, containing the ova above mentioned, were all in an inactive condition, not at all prominent, but situated entirely beneath the albugineous tunic.

The regular tumefaction, also, and rupture of the vesicle take place in both the human species and the lower animals in a manner entirely analogous; and since we know from direct observation that, in the latter, this process terminates by the discharge of an ovum, it is certainly unreasonable to suppose that it should have any other object in the former.

Fig. 6.



Cell-like bodies of the *membrana granulosa*. (Each division of the scale is 1-100th of a millimetre, or about .0004th of an inch.)

Shortly after the rupture of the vesicle, the formation of the corpus luteum commences. In order, however, to understand distinctly the manner in which this body is produced, it will be necessary to recall the anatomical relations of the vesicle and its neighbouring tissues. The Graafian vesicle, in its ordinary quiescent condition, consists of a simple globular sac, filled with a transparent, albuminous fluid. It is not very closely connected with the ovarian substance, and by a little manipulation can be removed entire; when it appears as a smooth, dia-



phanous cyst, usually with several distinct blood-vessels ramifying over its surface. It is said to be lined by an inner membrane, the *membrana granulosa*, composed of minute, granular, cell-like bodies, similar to those which, collected in a more compact mass round the ovum, constitute the *proligerous disc*. These bodies are of a flattened form, and nearly circular in outline when isolated, but when crowded together they are compressed into more or less angular forms. They have altogether the appearance of cell-nuclei rather than of cells, and frequently exhibit a very distinct nucleolus. They are undoubtedly to be regarded as a kind of *epithelium*, lining the serous surface of the Graafian vesicle.

The *membrana granulosa*, however, is so exceedingly delicate that it is very easily broken up, and detached from the internal surface of the vesicle by the necessary manipulations; so that, in ordinary dissections, it is seen only as a collection of soft, whitish, membranous flocculi, which give to the fluid of the vesicle an appearance of turbidity. External to the vesicle are a number of irregular vascular laminae of cellular substance, which can only be raised in strips and fragments, varying in size and thickness. These cellular layers have sometimes been described as a third tunic of the Graafian vesicle, *membrana cellulosa* (*membrane celluleuse*, Pouchet); but they appear rather to belong to the tissue of the ovary, and to form a sort of nidus, or bed for the reception of the vesicle.

When the ovum is expelled, the proligerous disc, and probably a considerable portion of the *membrana granulosa*, are expelled with it. The proper membrane of the vesicle then begins to become hypertrophied; the hypertrophy consisting in a peculiar growth of soft, yellowish, friable substance, which takes place most abundantly at the deepest part of the vesicle, and becomes thinner and thinner as we approach the vicinity of the cicatrix. As this new growth proceeds, the membrane of the vesicle becomes, at the same time, folded upon itself in all directions, so as to present innumerable convolutions and anfractuositities, which give a radiated appearance to its cut surface. This peculiar arrangement seems to be a necessary consequence of the increased nutrition of the membrane, which is, at the same time, confined nearly within its original limits. We see the same thing take place in other tissues of the body under similar circumstances, as in varicose veins, enlarged ureters, &c. The gray substance of the brain, during the first five months of foetal life, presents a smooth surface, without any trace of convolutions. As it afterward increases rapidly in extent, the cranial cavity, at the

same time, not enlarging in proportion, it becomes necessarily folded upon itself, in order to accommodate its increased bulk to a proportionally smaller cavity. The *valvulæ conniventes* of the small intestine are another example of the same thing. These are not present during the greater part of foetal life, the mucous membrane being then of the same length as the muscular coat. But, as it afterward grows more rapidly than the latter, it is thrown into folds which project into the cavity of the intestine. It is the same process which gives rise to the formation of the corpus luteum. At the same time that the hypertrophy of the vesicular membrane proceeds, the blood effused within its cavity also undergoes an alteration. Its fluid part is absorbed, and afterward the coagulum loses by degrees its colouring matter, becoming paler and paler, in proportion to the time which has elapsed since the rupture of the vesicle. The vascularity of the neighbouring parts also increases, or, at least, does not diminish, and at the end of about three weeks from the termination of the menstrual period, the corpus luteum has attained its maximum of development. Its situation is then marked by a concentration of vessels on the surface of the ovary, and by a globular or ovoid tumour, about the size of the end of the finger, which causes a slight prominence externally. The cicatrix is not always strongly marked at this period, and may consist only of a small, bluish, transparent spot, indicating a separation of the ruptured peritonem. The tumour, though well defined, is soft and yielding, and does not give to the touch the impression of a very highly organized body. It does not now contain any cavity, properly speaking; but its centre is occupied by the solid, semi-transparent, gray, or greenish coagulum, more or less mottled with red. The coagulum is in immediate contact with the inner surface of the yellow wall, but can be separated from it by a little manipulation, as the two have no organic connection. The wall itself still forms the smallest part of the tumour, as it is very thin; not more than one-eighth of an inch thick at its deepest part, when allowed to remain folded up; but if the convolutions are unfolded, it is seen to be, in reality, much thinner.

The point of rupture of the vesicle is still very well marked on a section of the corpus luteum, provided the incision be made accurately through the external cicatrix; for at that spot the yellow wall terminates, and the central coagulum is in immediate relation with the peritoneal coat. If a horizontal section be made, and the coagulum removed from over the point of rupture, the sinuosities of the yellow wall may also be seen radiating from it as a centre.

The new growth or deposit of yellow matter, when examined under the microscope, is seen to consist of an abundance of peculiar, irregularly-shaped, granular cells, varying in size, and sometimes enclosing minute, opaline, yellowish globules, like oil. The contour of the cell-wall can, in most cases, be completely traced throughout; but, in some instances, it is indistinct at certain parts of the circumference. There are also to be seen, in the field of the microscope, a few oil-globules, similar to those in the interior of the cells; but for the most part of larger size. The cells are rendered paler by acetic acid, and their (oily) granules and globules become more distinct, but no proper nucleus is visible.

Fig. 7.



Cells from the wall of the larger corpus luteum in Pl. I. Fig. 3 (same scale).

Dr. Frank Renaud\* has given an excellent description of these cells. He is disposed, however, to regard the oil-globules as the "nuclei" of the cells, whereas they do not have at all the appearance characteristic of ordinary nuclei, but seem to be rather a production of the cell itself. Indeed, the oil-globules evidently increase in quantity in proportion as the cells become atrophied and disappear.

According to the present observations, the yellow matter is essentially a growth of the proper membrane of the Graafian vesicle. Much difference of opinion, however, has prevailed among writers with regard to this point, some asserting, as above, that the new growth consists in a hypertrophy of the outer membrane (Knox, Pouchet), others that it is a development of the inner membrane (De Bäer), others that it is deposited between the two (Montgomery), and others that it is external to both (Lee). A part of this discrepancy, no doubt, arises from confusion and misunderstanding as to what membranes are designated by the terms "inner" and "outer." Dr. Montgomery, for instance,† could never have spoken of the inner coat of the Graafian vesicle as a "strong white cyst," if, under the name of the "inner coat," he had intended to designate the membrana granulosa. Some writers, indeed, recognize the cellular

\* London and Edinburgh Monthly Journal of Medical Science, August, 1845.

† Op. cit. p. 226.

laminae, already spoken of, lying external to the outer membrane, as a proper tunic of the vesicle. In reality, they cannot be so considered; and when we take into view the exceedingly friable nature of the "*membrana granulosa*," it appears most correct to describe, with Raciborski, only *one proper membrane* of the Graafian vesicle, the "*ovisac*" of Barry, the "*vésicule ovulifère*" of Pouchet.

This is the membrane, which, by its development and consequent folding up, forms the corpus luteum. That the yellow wall is not lined by any second membrane, I have made certain by frequent observations. At the same time, it must be remarked that, after a longer period of time, the enclosed coagulum, flattened and compressed, and deprived by absorption of all its colouring matter, may present a deceptive resemblance to a true membrane; particularly as at advanced periods, and in the corpus luteum of pregnancy, it becomes more closely adherent to the yellow wall. Dr. Robert Lee, in his Lectures on Midwifery, published in the *London Medical Gazette*, even gives two drawings of corpora lutea (of pregnancy), in which, in accordance with his ideas, there are demonstrated two distinct membranes within the yellow wall. These must certainly have been formed accidentally, by an artificial separation of the central coagulum into laminae. In the corpus luteum of menstruation, and also in that of pregnancy, if of recent date, it is easy to demonstrate the entire absence of any real lining membrane.

Externally the corpus luteum is invested with an extremely thin, transparent, vascular membrane, to which it is intimately connected, and which sends prolongations between the convolutions of the yellow matter. This layer, indeed, seems to form rather a *membranous surface* than a distinct tunic, and cannot be stripped off without bringing with it torn fragments of the yellow matter. It is, in fact, the outer surface, merely of the membrane of the vesicle, the new growth having sprouted from its internal aspect, toward the cavity of the vesicle. External to this, are the vascular layers of cellular tissue, which have already been described as surrounding the Graafian vesicle, and forming a nidus for it in the ovarian tissue, previous to the time of its complete development.

The substance of the corpus luteum is not vascular, though minute red vessels may often be seen, apparently running into the yellow matter, from without inward. A close examination, however, shows these vessels to exist only in the interstices of the convolutions, where they have penetrated from the vascular network on the external surface of the body.

It has been already shown that the development of the yellow matter commences soon after the rupture of the vesicle has taken place. The strange theory regarding these bodies, entertained by Sir Everard Home, and afterwards adopted by Négrier, viz., that the yellow matter is deposited before the rupture, that it is intended to afford nutrition to the ovum, and that, consequently, corpora lutea are only one stage of the *ascending* development of the Graafian vesicle, must certainly be regarded as entirely erroneous. It is disproved in the most positive manner by several of the accompanying observations. We see, for instance, in one case the Graafian vesicle large, prominent on the surface of the ovary, distended with serosity, and apparently on the point of rupture, while the vesicular membrane has, as yet, undergone no change.

Secondly, we have Graafian vesicles, freshly ruptured and filled with blood, with the vesicular membrane equally unaltered as before.

Thirdly, beyond this period we have corpora lutea in all stages of retrogression; but wherever the deposit of yellow matter has taken place, the vesicle contains blood, and has evidently been ruptured. The only exception to this rule is in the case of some very small corpora lutea, which have already been long subjected to the process of absorption, and in which it is therefore difficult to recognize the remains of the coagulum.

It is not, however, necessary to rely entirely on the accompanying observations, to disprove the theory above alluded to. Négrier himself refers to the cases "communicated to him by Dr. Ollivier D'Angers," of two women who committed suicide during a menstrual period. In each case, one ovary presented a bloody ruptured vesicle ("*rupture vésiculaire saignante*"), containing a soft and recent coagulum. But nothing is mentioned, in either case, about any alteration of the inner surface of the vesicle. In the three cases by Bischoff, already referred to, of recently ruptured vesicles, there is no mention made of any yellow deposit being visible. There is also another exceedingly interesting case of the rupture of a vesicle during menstruation reported by Dr. Myddleton Michel in the *Charleston, S. C. Medical Journal* (quoted in the *American Journal of Medical Sciences*, July 1848). It was that of a woman who was executed for murder. She had been imprisoned several weeks previously to the execution, and had undoubtedly been deprived of sexual intercourse. At the examination, the os uteri was found "open, tumefied, and dripping with blood," and its inner surface coated with blood, and "congested" at its upper part. The right ovary contained a number of vesicles in

process of development, containing clear fluid. The left had a ruptured vesicle on its anterior surface, with its orifice partially closed by a bloody coagulum. The membrana granulosa (examined by the microscope) also protruded through the opening. The cavity of the Graafian vesicle was filled with coagulated blood. Its tunic was very vascular, and "*had not yet begun to fold, to form the corpus luteum.*" The precise period during menstruation at which death took place in this instance was not ascertained with certainty.

Négrier, however,\* gives one observation on this point which is not very easily explained. He describes very accurately a recent corpus luteum of menstruation found by him in an ovary which, as he says, did not present on its surface "any trace of rupture." With regard to this, I can only say that I have not met with a similar case, and that it is contrary to the experience of most other observers.

After the end of the third week from the close of menstruation, the corpus luteum passes into a retrograde condition. It diminishes in size; and the fibrinous coagulum becomes absorbed, and loses still farther its colouring matter. The diminution of the size of the body takes place more particularly in a certain direction; so that, from having a globular or ovoid form, it becomes collapsed and flattened, either laterally or from within outward. In consequence of this flattening, the corpus luteum at this period may appear to vary considerably in size, according as the section has been made in the plane of its compressed surfaces or perpendicularly to them. Thus, in Observations IX. and X., both of which give specimens of corpora lutea four weeks after menstruation, the apparent size of these bodies is very different. But, if we consider that one has evidently been cut across, while the other was probably divided in the plane of its compression, the difference will not appear so striking. Still, it is undoubtedly the case that these bodies do not, in all instances, become atrophied with the same rapidity, and that more or less variation is apparent in this, as in most other physiological operations of nature. It is certain, too, that the effused coagulum does not always lose its colour with the same readiness; since, in some of the drawings which represent corpora lutea of four weeks or over, the clot is even redder than in Observation VI, where it is represented at the termination of the third week.

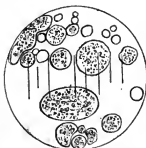
The colour of the yellow wall, however, during the early part of the retrograde stage, instead of fading like that of the fibrinous

\* Op. cit. page 22.

clot, becomes more strongly marked. From the dull yellowish-red hue, similar to that of recent lymph, which it had at first, it assumes a brighter and more decided yellow, and contrasts, therefore, more strongly with the neighbouring tissues. This yellow hue of the corpus luteum has been attributed by various writers to an alteration in the colouring matter of the effused blood, similar to that which takes place in the neighbourhood of old apoplectic clots. Pouchet\* so considers it, and Raciborski† entertains the same opinion. A microscopic examination of the corpus luteum at this period, however, demonstrates that this colour depends principally on the presence of oil, which is seen in larger or smaller globules, and having the same yellowish tinge which is presented by the whole body when viewed by the naked eye. The oil-globules, in fact, which, at an earlier period, were seen in small numbers and of minute size, and for the most part enclosed within the irregular granulated cells, have now become large and abundant, so as to occupy nearly the whole field, while the cells themselves have disappeared, or are with difficulty distinguishable. Everything leads us to believe that the cells are a formation destined to produce the oil, as a gland its secretion; and that, when they have accomplished this purpose, they disappear and are replaced by the ordinary fibrous tissue of the ovarian stroma.

As the corpus luteum diminishes in size, the yellow matter becomes softer and more friable, and shows less distinctly the markings of its convolutions. At the same time, it is more intimately connected with the neighbouring tissues, so that it can be less readily enucleated from the ovary. The central coagulum is no longer anything more than a faint, whitish, stellate cicatrix; while the yellow matter itself often also assumes a stellated, triangular, or other similar form, and pursues constantly a retrograde course, which terminates finally in its obliteration. When the corpus luteum, however, has reached this advanced stage of retrogression, it appears to become comparatively stationary, and its alterations proceed less

Fig. 8.



Oil-globules from the smaller corpus luteum in Pl. I. Fig. 3 (same scale).

\* Page 146.

† Page 437.

rapidly than at an earlier period; so that it may remain for some months afterward as a minute, faint, obsolete, yellow spot, imbedded in the ovarian substance. In the case of Mrs. A., Observation IX., seven of these obsolete yellow bodies were distinguishable, besides that resulting from the last rupture of a vesicle, the oldest of which probably dated from a period of eight months. In general terms, then, it may be stated that a period of six to eight weeks is sufficient to reduce the corpus luteum of menstruation to an insignificant, soft, thin, compressed sac, measuring less than a quarter of an inch in its longest diameter, and with its opposite walls nearly or quite in contact; but that after this time it remains more quiescent, and that a period of eight months sometimes elapses before its final and complete destruction.

There is good reason to believe that, in connection with the processes of menstruation, a peculiar change takes place in the internal surface of the uterus, which results in the formation and separation of a decidual membrane. Pouchet,\* indeed, considers the regular monthly formation and discharge of a decidua as satisfactorily established. Dr. Robert Lee† states that the uterine decidua is a thing of frequent occurrence in unmarried females, and does not consider its presence as the slightest evidence of the existence of pregnancy. He cites also Drs. Baillie and Blundell in support of the same views. The last-mentioned writers, however, are not disposed to consider the formation of a decidua, unconnected with pregnancy, as a regular physiological phenomenon, but rather as an occasional appearance, dependent perhaps on difficulty of menstruation. In reality, however, it is very probably a process which recurs spontaneously somewhere about each menstrual period.

The mucous membrane of the uterus, in its ordinary inactive condition, presents a smooth, pale surface, of considerable firmness. It does not have the appearance of a distinct membrane, but rather of a membranous surface, owing to the softness of its structure, and its intimate connection with the subjacent uterine tissue. It is only occasionally that we can succeed in raising with the forceps very thin, delicate strips, which in reality appear to be rather portions of epithelium than of the mucous membrane itself. At this time, it is difficult for the eye to distinguish any peculiarities of structure, but when, at certain periods, the membrane has become swollen and hypertrophied, numerous, very minute, whitish, wavy

\* Page 249.

† London Med. Gazette, vol. xxxi. p. 412.



or zigzag lines may be seen running from the inner part of the substance of the uterine parietes, and terminating on its free surface. In the ewe, these lines are much more distinctly seen, particularly at those spots where the cotyledons are afterward to be developed. These appearances, together with the remaining parts of the uterine mucous membrane, are described at length by C. B. Reichert in the first number of Müller's Archiv for 1848.\* According to him, these whitish lines are the glandular ducts or tubuli of the uterine mucous membrane; which open upon its free surface, and are lined by a continuation of its epithelium. After conception, this portion of the membrane becomes much hypertrophied; the tubuli are lengthened, and their orifices, destined afterwards to receive the villi of the chorion, become visible on the surface. The membrane increases also in vascularity, and becomes soft and spongy, and finishes by being transformed into the decidua vera, and at last expelled from the uterus. This change has also been recognized by other writers as taking place after conception, and Dr. Carpenter† even states that it "occurs whether the ovum reach the uterus or not, it being probably invariable in cases of extra-uterine pregnancy."

The preceding observations, however, make it probable that this formation accompanies the regular processes of menstruation, whether the ovum be fecundated or not. It will be noticed that, in all the foregoing cases except four, viz., Obs. I., II., VIII., and XI., there existed more or less softening and sponginess of the uterine mucous membrane. In two of these four cases, Obs. I. and VIII., a decidual membrane had just been separated, or was nearly so, and was found in the cavity of the uterus. In Obs. II., it had very probably been expelled from the organ, and in Obs. XI. all the functions of the generative system had been suspended for more than two months; a circumstance which accounts satisfactorily for the absence of any alteration in the mucous surface of the uterus. In Obs. X., in which the softening existed, but only to a slight degree, these functions had been arrested for a period of about four weeks.

The separation and expulsion of the decidual membrane seem to take place about the time of the rupture of the Graafian vesicle, that is to say, toward the termination of the menstrual period. After this

\* Ueber die Bildung der binfälligen Häute der Gebärmutter, und deren Verhältnisse zur placenta uterina.

† Principles of Human Physiology, p. 579.

separation, the internal surface of the uterus is left firm, pale, and smooth. It soon recommences, however, to become hypertrophied, and in the course of a short time it presents a soft, velvety, shaggy alteration, extending to the depth of three-sixteenths or a quarter of an inch, and showing very distinctly the whitish, wavy, or zigzag tubuli, intermixed with numerous fine blood-vessels, extending toward the free surface of the membrane. The decidual membrane is, in this way, in process of preparation during the descent of the ovum through the tubes, and while it is yet unprepared to make any vascular connection with the walls of the uterus. •

## PART II.

### CORPUS LUTEUM OF PREGNANCY.

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#### OBSERVATION XII.

Corpus luteum of pregnancy about the end of the second month.

R. D. L., a married woman, twenty-nine years of age, died in Boston on the 28th of April, 1851, under the following circumstances. She sat down to the tea-table with her family, in perfect health, on the evening of Friday the 25th. While they were at tea, a notorious quack, a Thompsonian, who had already been at the house in the early part of the afternoon, returned; and Mrs. L. left the table, and went up stairs to her chamber in company with him. She was known to have previously resorted to this man for the purpose of procuring abortion.

After remaining for some time in the chamber with Mrs. L., the Thompsonian left the house, but Mrs. L. kept her bed, and, in fact, never left it from that time till her death, which took place on the Monday following. On Saturday she was quite ill, and on Sunday so much worse that her friends insisted on discharging the Thompsonian and calling in other advice. Dr. M. S. Perry was accordingly sent for. On arriving, he found Mrs. L. exceedingly collapsed, and presenting marked signs of peritonitis. There was so much disturbance of the intellectual faculties that the patient was unable to give any account of herself; but her appearance and symptoms were so characteristic that Dr. P. at once concluded that abortion had been produced. He sent for Dr. C. E. Buckingham, who in the evening visited the patient with him, and concurred entirely in his diagnosis. There was no reaction of the system at any time after Dr. P. was first called, and the patient died on Monday about 11 A. M.

The friends of the woman were convinced that abortion had been produced; and there were various other suspicious circumstances,

besides those above related, which were testified to at the inquest. Owing to the absence of her husband, there were reasons why Mrs. L. should wish to have the fact of her pregnancy concealed. The verdict of the coroner's jury was that she came to her death in consequence of an abortion produced by the above-mentioned Thompsonian.

At the autopsy, which was performed on the day succeeding death, the body generally presented an appearance of perfect development and full health. There were no marks of disease except such as were quite recent. These consisted in a moderate peritoneal effusion, and in some inflammation of the mucous membrane of the stomach, œsophagus, and larynx, rendering it probable that the patient had swallowed some irritating drug, a portion of which had found its way into the air-passages.

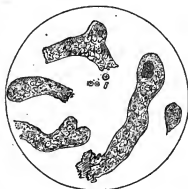
The uterus was much enlarged. It measured four and a half inches in length, two and three-quarters in width, and one and three-quarters in its antero-posterior diameter. Its increased thickness was caused by the bulging of its posterior face, which had a nearly globular form, while the anterior face was hardly more rounded than in the natural condition. There was some bright vascularity about the posterior face and fundus of the uterus, but not of an inflammatory appearance. The Fallopian tubes were also very vascular.

On cutting into the uterus from behind, its cavity was found to be entirely occupied by the reddened and hypertrophied mucous membrane, and a fibrinous-looking granular substance entangled with it. The walls of the uterus were of their natural colour and consistency, so far as regarded their muscular substance, but the mucous membrane was exceedingly hypertrophied and reddened, presenting all the appearances met with in the ordinary formation of decidua, in connection with menstruation, but in an infinitely greater degree. The decidua was continuous with the muscular substance, and could not be very readily separated from it; though the line of division between the two was very well marked, owing to their difference in colour; the latter being pale, the former dark red. The decidua was composed of a multitude of fine softish fibres, easily seen by the naked eye, which lay in a parallel position, and projected into the cavity of the uterus; hanging from its internal surface like the hair from a bear skin. On the posterior wall and a little to the right side, the decidua was much thicker than elsewhere, and was here continued into a moderately firm, stringy, fibrinous-looking mass, which enclosed a multitude of minute granules. This mass hung

down freely into the cavity of the cervix, and before opening the uterus, might be made to protrude from the os externum by compressing the uterus in the hand. Its lower extremity was soft, sloughy, and grayish; but its upper part still firm, red, and fresh-looking.

Examined by the microscope, it was evidently composed of the villi of the chorion, a part of which had remained, after the expulsion of the ovum, still entangled with the mucous membrane of the uterus. The villi presented somewhat the appearance of membranous tubes, of various sizes, terminating by a single or double cul-de-sac, and sometimes having lateral dilations or processes. With high powers, an appearance was seen as if the villi contained minute cells, or as if the tubes were lined with a delicate epithelium.

Fig. 9.



Villi of the chorion.

There was no blood in the uterine cavity, except at one spot on its posterior aspect, near the fundus, where there was a roundish cavity about the size of a pea, in the substance of the chorion and decidua, which was filled with very dark, but fresh-looking blood.

There was nowhere in the uterus any appearance of a defined placental attachment.

The right ovary, an inch and a quarter in length, was yellowish white externally, with several slender, old adhesions to its surface. It contained no corpora lutea, with the exception of a single yellow point, too small to show any definite structure. There were a number of Graafian vesicles beneath the albuginous tunic, varying in size from one-eighth of an inch diameter downward; but none projecting on the surface of the ovary, or at all visible from the outside.

The left ovary, considerably thicker than the right, showed on its posterior surface a slightly depressed spot, over which was attached a long, slender, organized, bridle-shaped adhesion, and in the neighbourhood of which a yellow colour showed through from beneath the fibrous coat. On making a longitudinal section through the de-

pressed spot, a corpus luteum was exposed, measuring seven-eighths of an inch in length by one-half an inch in depth. It consisted of a light-yellow, thin, convoluted external layer, and an enclosed, *colourless*, firm, fibrinous mass, with a central cavity containing a few drops of limpid fluid. The relations of the central coagulum, the yellow wall, and the investing membrane were the same as in all the corpora lutea previously observed. (See Plate II. Fig. 2.)

This ovary contained another corpus luteum, situated directly beneath the albugineous tunic, three-eighths of an inch long, but very narrow, and much compressed, the yellow matter very thin and friable, and incapable of being separated whole from the ovarian tissue. The walls of this corpus luteum were nearly in contact, and its contents colourless.

There was also another yellow spot, much smaller than the last, and very indistinct in structure, but which, apparently, was also an old corpus luteum of menstruation.

The left ovary contained but few Graafian vesicles which were visible, and those of very small size.

Both oviducts contained an abundance of thick, opaque, yellowish fluid, consisting mostly of ciliated columnar epithelium.

The period of pregnancy in this case was estimated, first, from the size of the uterus; and, secondly, from the fact that the placenta had as yet assumed no regular shape, while, at the same time, its future situation was sufficiently well marked by an unusual development of the villi of the chorion at one spot, and their adhesion to the uterine surface. It will at once be observed, on comparing the corpus luteum in this case, with that of Obs. X (Pl. I. Fig. 5), how great is the difference between them. The latter, of only four weeks' date, is already considerably advanced in the process of atrophy; while the former, nearly or quite twice as old, has still retained all its activity, and is, indeed, increasing in size, notwithstanding that sufficient time has elapsed for the colouring matter of the coagulum to be completely absorbed. The difference will be still more striking if we compare it with Pl. II. Fig. 1, in which the corpus luteum is of nearly the same date with the present.

## OBSERVATION XIII.

Corpus luteum of pregnancy about the termination of the fourth month.

E. S., a fine, healthy-looking girl, twenty-one years of age, died at the house of Mr. A., in Boston, on Wednesday the 7th May, 1851. She had been employed in Mr. A.'s family as a seamstress since the previous winter, living in the house during the week, but going away on Saturdays to her cousin's in Pleasant Street, and returning to Mr. A.'s on Monday morning. She had been for some months receiving the attentions of a young man who was reputed to be engaged to her. None of her friends suspected anything to be wrong with her until Monday evening, May 5th, when her cousin, with whom she had been spending Sunday as usual, perceived the odour of tansy in the room which she had occupied; whereupon it occurred to her that the girl might have become pregnant, and used the drug for the purpose of producing abortion.

On Tuesday she was in good spirits, and engaged in her ordinary employment throughout the day. She took leave of the family as usual, and went up stairs to her room about half past nine o'clock, P. M. Soon afterward, the family were alarmed by a scream, and on going up stairs, found the girl stretched on the floor by the side of her bed, insensible, and in violent convulsions. Dr. Samuel Morrill was immediately called, and I also saw her soon after. There was a strong odour of tansy in her breath, and, on searching the room, a two ounce phial was found in the pocket of one of the girl's dresses, still containing 3v of the oil of tansy. The mng from which she had drunk the oil was also found, with several drops remaining on the bottom. It was subsequently ascertained that she had purchased the phial *full* of oil of tansy a few days previously. She remained totally insensible, with violent convulsions at short intervals, till a quarter past 2, A. M., when she died.

At the autopsy, made May 7th, ten hours after death, there were found some marks of congestion of the brain. The stomach and upper part of the small intestine contained an abundance of oil of tansy. On first opening the body, the odour of tansy was powerfully exhaled from the cavity of the peritoneum, from the interior of the heart, and from the cut surface of the pectoral muscles.

The uterus was enlarged so that its upper edge was two inches and three-quarters above the level of the symphysis pubis. It was also

slightly inclined to the left, and lay in a somewhat diagonal position, so that its left edge was considerably nearer the abdominal parietes than the right. Its external surface was generally yellowish-gray, mottled, in some situations, with large bundles of red vessels, but without any inflammatory appearance. The vascularity of the oviducts was also quite moderate.

The uterus, unopened, weighed one pound. Its length, including the neck, was six inches and a quarter. Length of neck, measured internally, was one inch and three-eighths. Breadth of uterus, four inches and one-eighth. The amnion and chorion were in contact. The placenta was perfectly formed, circular in shape, three inches in diameter. The cord was five inches long, very slightly twisted from left to right. It was well covered with gelatinous matter.

The umbilical vesicle still existed as a delicate, flattened, pellucid sac, three-sixteenths of an inch in diameter, situated beneath the amnion, on the internal surface of the placenta, at a distance of three-quarters of an inch from the insertion of the cord. In its centre there was a yellowish, granular, opaque spot. A single fine red vessel ran from the insertion of the cord to the vesicle, and then branched over it in minute ramifications.

The foetus, a female, was nearly six inches in length. Its surface was smooth, without sebaceous covering or hair. Skin transparent, and everywhere marked by an elegant vascular network. It showed also very distinctly the numerous hair follicles as minute, opaque, white specks. The muscles were contracted, and the limbs rigid. Umbilicus situated a little above pubis. Middle point of body situated nearly midway between umbilicus and lower end of sternum. Head voluminous. Mouth widely open. Tongue well formed. Eyelids in contact; not to be separated without forcibly tearing epidermis. Pupils widely dilated. Nostrils open. Pupillary membrane complete. Fingers and toes completely formed, and nails distinctly visible.

External genital organs distinct. Clitoris projecting far beyond nymphæ.

The liver came down nearly as low as pubis. The kidneys and supra-renal capsules were equal in size: kidneys pale and lobulated; capsules dark red.

The large intestine was destitute of either transverse or longitudinal bands.

Ossification of the ribs was sufficiently well advanced. Consider-



able ossification of ilium; none of ischium or pubis; none of calcaneum; none of ossicula auditûs.

The fœtus was, therefore, estimated to be about four months old.

The left ovary, which hung down a little lower than the right, had, on its outer extremity, a small conical prominence, where the fibrous coat was wanting, and its place supplied by peritoneum alone. There was a slight appearance here of a cicatrix, visible only on close inspection. No unusual vascularity here or at any other part of the ovary. Beneath this prominence, the corpus luteum could be felt through the ovarian tissue tolerably firm and well defined, and having the form of a sphere, compressed laterally, much like that of the crystalline lens. On dividing the ovary longitudinally through the prominence, the corpus luteum presented a nearly circular section, seven-eighths of an inch in its long, and three-fourths of an inch in its short, diameter. (Plate II. Fig. 3.) The convoluted wall was of a *dull* yellow, considerably less brilliant than in the preceding case, and decidedly thicker, as it measured, at its deepest part, a little over three-sixteenths of an inch in thickness. The space enclosed by the yellow wall was occupied by a fibrinous, colourless, reticulated coagulum, which possessed a few minute vessels. This central coagulum was much compressed laterally; for, though it presented a cut surface of about half an inch in diameter, it had hardly more than one line in thickness. There was no *cavity* nor fluid anywhere.

Both ovaries were carefully divided in every direction, but only one other body was found bearing any resemblance to a corpus luteum, and that was so small and imperfect as to be hardly recognizable. There were many Graafian vesicles in the interior of each ovary, varying in diameter from three-sixteenths of an inch downward, but none at all prominent on the surface. Both ovaries were quite healthy.

On comparing this case with that detailed in Obs. XII., it will be seen that the corpus luteum has increased in development. The convoluted wall has become thicker, and has begun to lose its brilliant tinge; the fibrinous coagulum has become more compressed and absorbed, and the central cavity, if any had existed, is completely obliterated. At the same time, it is interesting to observe that the old corpora lutea of menstruation, of which three existed in the preceding case, have now been reduced to one. They have, in fact, successively disappeared, while the corpus luteum last formed has continued its development under the influence of pregnancy.

## OBSERVATION XIV.

Death at the termination of the seventh month of pregnancy—One ovary destroyed by disease, the other containing two corpora lutea—A blighted ovum in the corresponding oviduct, and a seven months' fetus in the uterus.

M. M., a married woman, thirty-two years of age, stout and full-blooded, died suddenly at Lowell, on Tuesday, December 17th, 1850. She was the mother of four children, the youngest of whom was two years and a half old. At the time of her death, she considered herself to be seven months advanced in pregnancy, expecting to be confined in the middle of February, 1851.

Her husband, who performed duty as a night-watchman, left his wife on Monday, the 16th, at 11 P. M., apparently in perfect health. She had then retired to bed, but talked to him, just before he left, in her ordinary cheerful manner. He passed his watch, and returned home next morning at 5 A. M., and, on going up to his wife's chamber, found her lying on the floor, warm but quite dead. There were no appearances of any disturbance in the room. The husband immediately gave the alarm, and a physician was called; but there were no signs of life.

At the autopsy, next day, there were no marks of violence to be seen, with the exception of some slight bruises on the right knee, and the right side of the head and face, which she might easily have received in falling. All the internal organs were in a state of marked congestion, and the blood was everywhere fluid. No other lesion, however, was discoverable anywhere, with the exception of a change in one of the ovaries, and one or two serous cysts in the liver, which could not, in any way, account for death.

The uterus, of a natural grayish-yellow, and dull-red colour, was in the median line. Its upper edge was half an inch above the level of the umbilicus (subject lying on the back). It was covered for the upper third of its anterior surface by the transverse colon and great omentum. It measured eleven and one-fourth inches in its long diameter, and eight and one-eighth inches in its transverse. It weighed, unopened, a little less than seven pounds. The thickness of the uterine parietes, at its fundus, was three-eighths of an inch. The cervix uteri, two inches in length, was plugged by a mass of colourless, tenacious secretion. Its lower extremity was lax and soft, admitting the little finger with ease; but its upper part was

contracted and impassable. The os uteri and upper portion of the vagina were of a purplish colour; the rest of the vagina being of a light rosy hue.

The chorion and amnion were in contact; and the amniotic fluid something over one pint in amount. The placenta was situated at the lower and anterior part of the uterus, a short distance from the uterine orifice of the cervix. The cord measured nineteen inches in length. The fœtus, perfectly formed, weighed, together with one inch of the cord, three pounds. It had no cadaveric rigidity. Its skin was of a reddish colour, and had a thin covering of sebaceous matter. There was rather an abundance of dark hair on the scalp. The nails projected, in many instances, quite to the ends of the fingers; in others, not so far. They were all very soft. The eyelids were in contact, but not adherent. There was some opacity of each cornea. Both testicles had descended into the scrotum, but could be pushed back nearly into the cavity of the abdomen.

There was no mark of violence or disease about either the uterus or fœtus.

The right ovary, situated immediately beneath the liver, was almost entirely converted into an encysted tumour, nearly globular in shape, with thin, tough, membranous walls, and about the size of the foetal head. It weighed, unopened, a little less than one pound. It contained a mass of yellowish-white fatty matter, resembling lard in appearance and consistency. There were also a few drachms of thickish, dingy-yellow, oily fluid, with a fetid odour. Intermixed with the lardaceous matter, was a large quantity of long and short, dark-coloured hair; most of it, like the fatty matter, entirely unconnected with the internal surface of the cyst. This surface was, for the most part, smooth and glistening, like a serous surface; but at one spot it assumed the appearance of skin, becoming whitish-opaque, and provided with follicles, from which short hairs projected into the cavity of the cyst. At one spot underneath this scalp-like surface, was a considerable mass, like adipose tissue, and beneath that an irregularly-shaped piece of bone, hard, white, and surrounded by periosteum. There were two other, much smaller cysts, filled with transparent, gelatinous fluid, and a little of what appeared to be the remains of genuine ovarian stroma; but there were no normal Graafian vesicles, nor any other appearance natural to the organ.

There were no appearances of old or recent inflammatory action anywhere about the ovary, but all the surfaces externally were

smooth and normal; only the oviduct and its fimbriated extremity were of a lively red colour.

The left ovary, one inch and a half in length, was pale, and of natural appearance externally. On one of its lateral surfaces there was a small oval-shaped spot, where the albugineous tunic was wanting, and which showed a faint yellowish coloration. (Plate II. Fig. 4.) The centre of this spot showed a faint linear cicatrix, very slightly depressed, from which radiated a few red and purple vessels. The corpus luteum, situated immediately underneath, caused a slight prominence externally, and could be readily felt as a roundish, well-defined tumour, not hard, but still having considerable resistance. Its section, of an oval form, showed the body to be somewhat compressed from within outward. It was half an inch in length, and a quarter of an inch in depth. It consisted of a central, whitish, radiated cicatrix, surrounded by a thick, softish, elastic, and strongly convoluted wall. The relative proportion of these parts is exhibited in the drawing. (Plate II. Fig. 5.) No distinct communication of the central cicatrix with the exterior could be detected; probably owing to the abundant growth of the convolutions, which had reduced this communication to a linear cicatrix, easily missed in making a section of the ovary. The thickness of the wall was considerably less on its superficial than on its deep aspect. Its colour was a faint yellowish-white, not much unlike recent lymph, and very different from the bright yellow hue of the corpus luteum of menstruation, at an advanced period. It showed an abundance of fine red vessels converging from the exterior, which had at first the appearance of being situated in the substance of the wall, but which, on close inspection, seemed only to penetrate the interstices of the convolutions. Externally, the corpus luteum was invested by an exceedingly thin, transparent, vascular membrane, to which it was intimately attached, and with which it could be readily separated from the rest of the ovary; but, in performing the separation, several irregular strips of cellular tissue were raised with it.

Near the other extremity, and on the opposite surface of the ovary, was another spot similar to that already described; *i. e.*, a space where the fibrous tunic was wanting, and in which there existed a faint yellowish coloration, and a noticeable concentration of vessels. Immediately beneath, was a second corpus luteum, absolutely similar to the first except in being a little smaller as the section was made, *i. e.*, seven-sixteenths of an inch long, by a quarter of an inch deep. The central cicatrix here had a very distinct

communication with the exterior. The whole appearance of this corpus luteum indicated the same stage of development with the former.

The left oviduct was quite free and pervious throughout. On cutting it open, there was found, at a distance of three inches from its fimbriated extremity, a soft, greenish-yellow mass, about the size of a hazelnut. Externally, it was quite smooth and soft, and without any appearance of organization; but toward its centre it had considerable firmness and a more ruddy colour, and showed some fine red vessels, ramifying in its substance. Altogether, it had much the appearance of a slough of cellular tissue, which had not yet become quite disorganized and diffuent. At one spot it had distinct

vascular connections with the internal surface of the oviduct; but could easily be separated, leaving some shreds of the slough-like material adhering to the spot. There was no particular vascularity or other alteration of the mucous membrane of the oviduct in its immediate neighbourhood, but only some unevenness of surface at the point where the tumour had adhered.

There were absolutely no Graafian vesicles on the surface of the ovary, but several were situated beneath the albugineous tunic, along the free edge of the organ, varying in size from an eighth of an inch in diameter, downward. The ovary was carefully divided in every direction, but nothing else like a corpus luteum was anywhere to be met with.

It will immediately be seen how much this corpus luteum differs in appearance and description from those heretofore delineated, as existing in company with an unimpregnated uterus. This case is particularly interesting from the fact that two ova had evidently been discharged from the left ovary at about the same time, and had both been fecundated. One, however, contracted adhesions to the oviduct and became blighted after a very short period of development; while the other proceeded to the uterus, and underwent the ordinary changes of uterine growth. This woman had evidently a constitutional tendency to arrest the progress of the ova through the tubes, since very much the same thing had previously happened

Fig. 10.



Left ovary of M. M.—Second corpus luteum.

on the right side. For we must certainly regard these encysted tumours of the ovary, containing bones, fat, and hair, as the result of degenerate ova, which have become arrested at the ovary, either before or after their impregnation.

This case also makes it evident that it is not any particular change in the ovum itself, which gives a peculiar character to the corpus luteum of pregnancy, but the condition of the uterine organs generally; for we have here two perfect corpora lutea, though only one of the ova had become developed. If it were otherwise, as the ovum became blighted, its corresponding corpus luteum would have been atrophied simultaneously with it.

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## OBSERVATION XV.

Corpus luteum of pregnancy in the eighth month.

C. H., a woman, thirty years of age, evidently advanced in pregnancy, died at the Cholera Hospital in Boston, August 8th, 1849, after an illness of fifteen and a half hours.

The uterus came up nearly to the level of the umbilicus. It was pear-shaped, and inclined to the right side, so that full two-thirds of the organ lay to the right of the median line. It had a dull reddish vascularity on its external surface. The fluctuation of the liquor amnii could be readily felt through the uterine walls, as well as the head and limbs of the fœtus. The uterus measured nine and a half inches in its longitudinal diameter, and six and a half in its transverse. The thickness of its walls, divided through the middle of its anterior surface, was three-eighths of an inch. The os uteri had a rounded, tumefied appearance, and a dark purplish colour. The cavity of the cervix was filled with tenacious secretion. The attachment of the placenta was at nearly the middle part of the anterior uterine wall, but a little to the left of the median line. It was nearly circular in shape, and five-eighths of an inch in thickness. The chorion and amnion were in contact, and the amniotic fluid about fourteen ounces in amount. The cord was twenty-two inches in length.

The right ovary, one inch and three-quarters long, contained a corpus luteum, situated at one extremity of the organ. This body

was irregularly ovoid in shape, measuring nine-sixteenths of an inch in length, and half an inch in depth. It consisted of a firm, yellowish-white, well-organized looking substance, which showed fine red vessels converging towards the centre. It had no cavity, but its centre was occupied by an irregularly elongated, firm, opaline coagulum, closely connected with the rest of the body. Externally, there were the same layers of cellular tissue previously described.

The colour of this body was a much less decided yellow than is often seen in "false" corpora lutea. It differed from them also in several other respects, as follows:—

I. Its globular form, and firm, resisting feel.

II. Its organized appearance internally.

III. There was, on the surface of the ovary, at a spot corresponding to the corpus luteum, a well-defined, strongly-depressed cicatrix.

The ovary also contained a firm, opake, whitish body, in the situation indicated in the drawing, much smaller than the corpus luteum, and not exhibiting any of its peculiar structure; apparently a morbid growth.

The left ovary was two inches in length, but very slender and much atrophied. It contained a small, globular, whitish, opake body, like that mentioned as occurring in the right ovary (morbid). There was nothing else remarkable about the uterus or appendages.

The fœtus, a female, measured fourteen inches in length, and weighed, with one inch of the cord attached, three pounds five and a-half ounces. There was no cadaveric rigidity. The skin was of a rosy hue, rather thick and tough, and covered, over a great part of its surface, with fine, white, short hairs. The scalp was covered with fine dark hair, a quarter of an inch long. The nails reached nearly, but not quite, to the ends of the fingers. The umbilicus was situated an inch above the pubis, and three-quarters of an inch below the middle point of the body. The eyelids were in contact, but easily separated. There was slight opacity of each cornea. There was no pupillary membrane.

The foramen of Botal was a quarter of an inch in diameter, but could be completely covered, from the left side, by its valve. The

Fig. 11.



Corpus luteum of pregnancy  
in the middle of the eighth  
month.

arterial duct appeared like the continuation of the pulmonary trunk, while the right and left pulmonary arteries seemed to be only small branches.

There were no valvulae conniventes in the small intestine, and the large intestine was quite round and smooth, unmarked by either transverse or longitudinal bands. It was distended with dark greenish meconium from the ileo-cæcal valvo to within an inch of the anus. The kidneys were lobulated externally, and rather more bulky than the supra-renal capsules; but the *length* of the two bodies was the same, viz., one and one-eighth inch.

There were three points of ossification in the sternum. The calcaneum had one point of ossification, well advanced; and the astragalus also one point, just commenced. The axis had one point of ossification in its body, and another in the odontoid process.

The fœtus was therefore, in all probability, seven months and a-half old.

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## OBSERVATION XVI.

Corpus luteum at the termination of pregnancy.

E. S., a healthy woman, about twenty-seven years of age, a patient of Dr. Samuel Cabot, was taken with labour pains on Wednesday, February 19th, 1851; only five days before her full time, according to the patient's reckoning. After labour had continued eight hours, rupture of the uterus took place, and the woman died five days afterward.

The uterus and ovaries were given to me by Dr. Cabot.

The body of the uterus was five inches and a half long, and its anterior wall a little over one inch in thickness. The cervix uteri was two and one-eighth inches in length, and thoroughly dilated. The os internum was distinctly marked by a slightly projecting ridge, viewed internally, at the lower extremity of the uterine body. The rupture was transverse, three and a half inches long, and situated just at the junction of the body of the uterus with the cervix. The edges of the rupture were everted, and retained in the everted position by a deposit of recent lymph; which was also abundant all over the peritoneal surface of the uterus. The right ovary was plentifully



covered with lymph, but, on stripping off this deposit, the cicatrix of the corpus luteum could be readily distinguished on the free edge of the organ. Immediately beneath, the body itself was indistinctly perceptible to the touch.

On cutting it open, the corpus luteum was seen to be of an indefinite, light-yellowish hue, but little contrasted with the remainder of the organ. The central coagulum was very scanty, having been reduced to a thin white cicatrix.

In the above drawing, the walls of the yellow body are shown very much folded in, at one spot. This is in consequence of the first section, from which the drawing was taken, not having been made directly through the centre; but another section, more successfully performed, showed its whole surface occupied by yellow matter, thrown into minute folds.

There was no other appearance of corpora lutea in either ovary, nor any prominent Graafian vesicles.

Fig. 12.



Corpus luteum at the termination of pregnancy.

## OBSERVATION XVII.

Corpus luteum of pregnancy nine weeks after delivery.

A. G., a married woman, twenty-six years of age, died in Boston, Sept. 20th, 1850, of irritant poisoning. In early life she had shown some symptoms of insanity, but of late years her health had been good. A fortnight previous to her death, she had lost an infant child, seven weeks old, and since that time had been much depressed in spirits, and had not had her usual appetite, but had not been otherwise indisposed. She left her home soon after breakfast on the morning of the 20th, and in the afternoon was found in the station house of the Western Railroad, evidently very sick, and unable

to give any account of herself. She was immediately removed to the Massachusetts General Hospital, where she arrived at half past four P. M. She was then much nauseated, with lividity and coolness of the skin, swelling of the lips, and a very rapid and feeble pulse. She could neither speak nor swallow. She rapidly became more and more collapsed and insensible, and died in a little less than two hours after her entrance.

At the autopsy, next day, the stomach was found excessively inflamed. It was somewhat contracted and collapsed, and contained six ounces of a dark red, bloody-looking fluid, which was thickened by holding in suspension a large amount of light reddish flakes, like those seen in the discharges of dysentery. The parietes of the stomach generally were exceedingly thickened, so that its anterior wall, near the pyloric extremity, measured three-eighths of an inch in thickness, and about the cardiac extremity nearly a quarter of an inch. This abnormal thickness was entirely owing to infiltration of the submucous cellular tissue, of a slight reddish tinge, nearly uniform throughout the organ. The mucous and muscular coats were unchanged in thickness.

The internal surface of the stomach was of an intense purple red throughout the middle third of the organ, where the mucous membrane was thrown into numerous transverse and longitudinal folds. In the great pouch the mucous membrane was of a dark slate colour, and had, at the same time, a finely granulated appearance, owing to its surface having been strongly corrugated and thrown into minute folds, of an opaque gray colour. There was also, at this part, much dark purple and black ecchymosis, situated in the substance of the mucous membrane, as well as beneath it. There was, besides, some redness of the small intestine, and much submucous infiltration and ecchymosis about the larynx and upper part of the trachea; as if some of the poison had accidentally found its way into the air-passages. There were no other morbid appearances of importance. The woman was known to have had corrosive sublimate in her possession previous to leaving home.

The vagina was smeared, at its upper part, with a little leucorrhœal secretion. The uterus, much reduced in size, was only a little larger than in the ordinary, unimpregnated state. The os uteri was transverse, purple, and much fissured. The internal uterine surface showed considerable dark-coloured redness, but was otherwise unaltered.

Both ovaries showed many Graafian vesicles in process of develop-

ment, but no sign of any recent rupture. One of them had also a very small and ancient-looking body, situated immediately beneath a depressed cicatrix, which was the only thing like a corpus luteum to be found in the ovary. The colour of this body was very similar to that of the ovarian tissue. Its section was slightly oval, about a quarter of an inch in diameter, and presented an opaque, whitish, central mass, external to which traces of a convoluted structure were visible on close examination. The whole aspect of the body, however, was obsolete and inactive, and its markings quite indistinct.

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### OBSERVATION XVIII.

Corpus luteum of pregnancy nine months and a half after delivery.

C. L., a married woman, twenty-six years of age, a patient of Dr. G. N. Thompson, died in Boston, June 24th, 1850. She was the mother of three children, the youngest of whom, a healthy boy, was nine months and a half old. The patient had not menstruated since the birth of this last child.

She was confined on the eighth of September, 1849, without any unusual occurrence. Two or three weeks after delivery, she was attacked, from some unknown cause, with salivation, followed by great irritability of the bowels, so that she had ten or twelve discharges daily; often bloody and mucous in character. These symptoms were at first controlled by remedies; but not long afterward the irritability of the bowels again returned, her strength and flesh failed, and the skin became excessively pallid. She improved again under tonic treatment, but afterward failed a third time; anæmia, emaciation, weakness, and irritability of the bowels being the most prominent symptoms. She had also a moderate cough, not frequent or troublesome. During the latter part of her life, the discharges from the bowels were not bloody nor mucous, but fluid and greenish. The intelligence was not affected.

At the autopsy, there was some sub-acute pneumonia of the posterior surface of both lower pulmonary lobes. There was also considerable ulceration of the lower part of the small intestine, and the mucous membrane of the large intestine was finely granulated and

roughened throughout its extent. There were no other remarkable appearances.

The body of the uterus was pale, and natural in size and consistency; but there were some morbid appearances about the os and the upper part of the vagina. The cervix and os uteri were considerably swollen, with an œdematous aspect, and a dark red and purple colour internally. The external parts of the os and upper portion of the vagina were equally dark coloured, and covered with large patches of a whitish, semi-opake exudation. The internal surface of the body of the uterus was lighter coloured. It was finely reticulated over the greater part of its extent, but there was a spot on its posterior wall which was smooth, and of a cicatrix-like appearance. The internal surface of the uterus was natural in consistency.

Fig. 13.



Left ovary of C. L.

Fig. 14.

Corpus luteum of pregnancy  
nine months and a half after  
delivery.

Both ovaries were rather large. They were pale, like the other organs, and entirely destitute of vascularity. Both presented externally several very shallow, bluish-looking cicatrices, but the left had, in addition, on its anterior surface, two puckered, strongly depressed cicatrices. (Fig. 13.) On making a longitudinal section, there was found, immediately beneath the deepest of these, and evidently con-

nected with it, a solid body, having a nearly circular section. (Fig. 14.) This body was *little or not at all distinguishable in colour* from the rest of the ovarian tissue, and might easily have been overlooked in a hasty examination. On close inspection, however, it was seen to be imbedded in the substance of the ovary, from which it was separated by a sufficiently distinct line of demarkation. It contained in its centre a body rather whiter and more opaque than the external parts, while the latter, on minute examination, presented indications of being traversed by radiating lines. The whole body was similar in consistency to the rest of the ovary, and could not be felt at all from the outside. It had no yellow nor red coloration in any part.

Both ovaries contained many Graafian vesicles in an inactive condition, but no other body than that described having any resemblance to a corpus luteum.

Both oviducts were natural in appearance and free from adhesions.

There can be no doubt that, *in the first periods*, the corpus luteum follows the same course of development, whether the discharged ovum becomes impregnated or not. Together with the rupture of the vesicle, the same effusion of blood takes place in either case, followed by a gradual absorption of the colouring matter of the clot, and hypertrophy and folding up of the membrane of the vesicle. When, however, the ovum becomes impregnated, and continues its growth in the uterus, the corpus luteum, instead of reaching its maximum of development at the end of three weeks, and afterward undergoing a rapid process of atrophy, *continues to develop itself* for a considerable period, and does not, in fact, become very decidedly retrograde until after the termination of pregnancy. At the same time the ordinary periodical processes of the ovary are suspended. No new vesicles protrude themselves from its surface, and even those which, at the time of conception, happened to be more or less prominent, appear again to recede and become concealed beneath the albugineous coat.

The difference in the progress of the corpus luteum, however, relates not only to its size, but also to its general characters and aspect. The external wall becomes much thicker in proportion to the central coagulum, and at the same time acquires a firmer and more highly organized structure. Moreover, the colour, both of the convoluted wall and of the central coagulum, constitutes an important means of distinction. It has been shown that the corpus luteum

of menstruation retains the bright yellow colour of its walls till the whole body has become much reduced in size; and that the coagulum in its interior also remains more or less stained with red till a late period. In other words, the substance of the corpus luteum diminishes more rapidly than its colour fades. On the other hand, if pregnancy occurs, the circumstances are reversed. The colour both of the wall and the coagulum fades rapidly after the first two months, while the *substance* of the yellow body continues to increase; consequently, during the greater part of gestation, the corpus luteum of pregnancy will be distinguished from that of menstruation by the dull hue of its convoluted wall, and by the absence of colour in the central coagulum.

The occasional existence of a central cavity in the coagulum, containing clear fluid, is a circumstance which has been noticed by several different authors. It does not seem to be an essential or even an ordinary appearance; since, among the eighteen observations on the human female which have been detailed in the preceding pages, we have met with it but once (Obs. XII). It is probably occasioned by an early closure of the rupture in the Graafian vesicle, by which the serum of the effused blood is retained in its interior, instead of being expelled through the aperture by the contraction of the coagulum.

It is difficult to ascertain with certainty the exact period of pregnancy at which the corpus luteum attains its maximum of development. It certainly constitutes a very perceptible tumour so late as the middle of the eighth month, and most of the older writers agree that it is to be found a short time after delivery. Dr. Robert Knox has drawn up a table of measurements of the corpus luteum at different periods of pregnancy, collated from various reliable authorities, which was published in the *London Medical Gazette*.

The table is as follows:—

*Dr. Knox's Table of Measurements of the Corpus Luteum.*

No. of days after impregnation.	Name of reporter.	Long diameter in lines.	Short diameter in lines.	Thickness of "glandular part."	Diameter of "central cavity."
5	Home	9	6	1½	
8	"	9	6	1½	
46	Lee	9	7½	1	6
62	"	6	3½	1	3
62	Clarke	9½	8	3	
70	Montgomery	7	6		
93	"	7½	6½	2½	3
108	Keever	9	7	2	4½ and 2½
118	Knox	7	6		
155	W. Hunter	8½	7		4½ and 1½
186	Roderer	6	5	3	2
186	Montgomery	6	5	3	2
186	Home	7½	4½	1	4
201	Lee	6	4½	1	3
280	Roderer	7	4		
280	Montgomery	6	5		
289	W. Hunter	6	5		
285	Knox	4	2½	1½	1½

It appears probable from this table that the period of the greatest thickness of the convoluted wall, the structure which constitutes the most characteristic portion of the corpus luteum, continues from the beginning of the third to the end of the sixth month, and that the entire bulk of the corpus luteum is also the greatest between nearly the same periods. After delivery, the corpus luteum rapidly diminishes; though its characteristic structure is still to be distinguished for many months by close inspection.

The corpus luteum of pregnancy, then, differs from that which is merely the result of menstruation in several important particulars.

I. It arrives more slowly at its maximum of development, and afterward remains for a long time as a very noticeable tumour, instead of undergoing a process of rapid atrophy.

II. It retains a globular, or only slightly flattened form, and gives to the touch a sense of considerable resistance and solidity.

III. Internally, it has an appearance of advanced organization, which is wanting in the corpus luteum of menstruation.

IV. Its convoluted wall, particularly, attains a greater development, this portion measuring sometimes so much as three-sixteenths to one-fourth of an inch in thickness, while in the corpus luteum of menstruation it never exceeds one-eighth, and is almost always less than that. This difference in the thickness of the convoluted wall is one of the

most important points of distinction. It will be much more striking when viewed *relatively to the size of the central coagulum*.

V. The colour is not, by any means, so decided a yellow, but a more dusky and indefinite hue.

VI. If the period of pregnancy is at all advanced, it is not found, like the corpus luteum of menstruation, in company with unruptured vesicles in active process of development.

The preceding historics and observations will serve to show how very imperfect are some of the marks which various writers have heretofore laid down as distinguishing "true" from "false" corpora lutea. Dr. Montgomery\* gives seven characteristics by which, he says, the "false" or "virgin" corpora lutea may be recognized.

"I. There is no prominence or enlargement of the ovary over them."

This is manifestly incorrect, for the corpora lutea of menstruation often cause a noticeable protuberance on the surface of the ovary, as may be seen in Observations II., IV., V., VI., and VII.

"II. The external cicatrix is almost always wanting." According to the present observations, an external cicatrix is always present in the corpus luteum of menstruation, and in fact must necessarily be so, since these bodies result from the rupture of a vesicle, in the same manner with the corpora lutea of pregnancy.

"III. There are often several of them found in both ovaries," &c. This is, no doubt, a very important distinction, since we never find more than one corpus luteum of pregnancy at a time, unless in cases of twins; and then the two corpora lutea are evidently of the same date, and have the same aspect, while the co-existent corpora lutea of menstruation are usually in many different stages of retrogression.

"IV. They present no trace whatever of vessels in their substance, of which they are, in fact, entirely destitute, and of course cannot be injected."

According to the present observations, the distribution of vessels in the two different kinds of corpora lutea is the same. In both, the substance of the convoluted wall itself is non-vascular; and the vessels exist only in the interstices of the folds. This fact is very easily demonstrated in a corpus luteum of menstruation when completely developed, as the convolutions are here pretty easily separated from each other; but in the corpus luteum of pregnancy the new growth from the internal surface of the vesicle has been so

\* Signs and Symptoms of Pregnancy, p. 245.



abundant, and the convolutions are consequently pressed so firmly together, that it is not always easy to decide whether a section has divided the substance of the wall, or only by accident passed between two convolutions; particularly as we have not so strong a contrast in colour, to assist us, between the yellow wall and red vessels, as exists in the corpus luteum of menstruation.

"V. Their texture is sometimes so infirm that it seems to be merely the remains of a coagulum," &c. This is frequently a good distinguishing mark.

"VI. In figure they are often triangular, or square, or of some figure bounded by straight lines." This has already been seen to be an appearance frequently presented by the corpus luteum of menstruation, at an advanced period of atrophy.

"VII. They never present either the central cavity, or the radiated or stelliform white line which results from its closure." This last distinction is so exceedingly incorrect that it is difficult to understand how it could have been laid down by such an observer as Dr. Montgomery. The corpus luteum of menstruation *always* presents a central cavity, *i. e.*, a space included by the convoluted wall, which space is filled by a coagulum; and as the whole yellow body becomes atrophied, the coagulum is transformed into a radiated or stelliform cicatrix, more or less coloured with blood, according to the rapidity with which the absorption of the hæmatin has proceeded.

There can be no doubt, therefore, of the existence of certain distinct and reliable marks by which the corpus luteum may be recognized as a sign of pregnancy, and distinguished from all other appearances, either morbid or physiological, to be met with in the ovary. The length of time which elapses before its disappearance is alone sufficient to show that it is a peculiar and distinctive phenomenon. It has been demonstrated, in the foregoing pages, that the corpus luteum of menstruation becomes atrophied in a very short space of time. Other observations, also, bear testimony to the same fact. Négrier,\* who considers all corpora lutea as identical, says that the remains of the ruptured vesicle diminish successively with so much regularity that we "can appreciate the loss of volume which takes place from one month to another." "It is in accordance with such facts that I have been able to calculate that five to six months are sufficient to reduce the most voluminous corpora lutea to the size of a grape-seed; and that after two years a bluish stain is often the only vestige that remains."

\* Page 79.

Raciborski\* states also that a period of four to six months is sufficient to reduce the corpus luteum to an insignificant remnant; "a simple slate-coloured or yellowish trace."

Notwithstanding this, when the menstrual periods return with regularity, new corpora lutea are so rapidly produced that we meet with many of them of different sizes in the same subject. Thus, in Obs. X. we have four of these bodies, in Obs. VI. six, and in Obs. IX. so many as eight, co-existing in the same ovaries. On the other hand, the corpus luteum of pregnancy, after a certain period has elapsed, is found alone. It has outlived all vestiges of the vesicles previously ruptured, and no new ones have come forward to form fresh corpora lutea. If, however, the yellow body of menstruation were entirely similar to that of pregnancy, produced every month, and yet remaining nearly undiminished for the greater part of a year, we should find, in almost every female dead between the ages of fifteen and forty-five, the ovaries crowded with prominent solid tumours which could not fail to be recognized on the most superficial inspection. Pouchet would then never have been obliged to account for the failure of older observers to discover corpora lutea in the ovaries of virgins.† "If certain physiologists (De Graaf, Morgagni, Haller), not having been favoured by circumstances, never discovered corpora lutea in the virgin females of mammalia, we cannot, nevertheless, at the present day deny their existence," &c. These observers could hardly have failed to discover them if the corpora lutea of menstruation continued permanent for any length of time. It is this very circumstance of their rapid atrophy and disappearance, joined to the fact that almost all grave diseases check the ovarian processes for some time previous to death, that prevents our meeting more frequently with specimens of these bodies at ordinary post-mortem examinations. Pouchet himself gives some observations which of themselves establish partially the distinction above alluded to. One of them he adduces while speaking of the proofs of the regular maturation and discharge of ova in virgins. "In the case of a young woman," he says, "twenty years of age, I had the good fortune to discover together Graafian vesicles and their contents in all stages of development and retrogression. This woman had never borne children, and presented all the marks of virginity. The ovaries presented on the surface of their fibrous tunic many very noticeable cicatrices, vestiges of

\* Page 436.

† Page 125.

obsolete Graafian vesicles which had previously discharged their ovum. In the interior of the organs were to be seen many anfractuosités, which were probably merely Graafian vesicles which had been more recently ruptured. This appeared probable from the condition of their internal membrane, which was of a brownish colour, and appeared no longer to be in an active condition. Finally there existed, near the surface of the organs, eight vesicles, in different stages of development, and varying from one-half to one-sixth of an inch in diameter. Their internal membrane was like a mucous surface, ruddy and very vascular," &c. &c.

This girl's menstruation and ovulation had evidently, therefore, as Ponchet supposes, gone on in an uninterrupted manner till near the time of her death. Why, then, if the menstrual corpus luteum lasts as long as that of pregnancy, did he not find many yellow bodies in full development, instead of mere "anfractuosités" with a "brownish-coloured and inactive-looking internal membrane?" The same remark may be made with regard to other similar observations, as those by Bischoff already referred to (op. cit. p. 50), and those by Dr. Seymour, when he says, "I have examined ovaria in many instances; many had ova (Graafian vesicles) ready for impregnation large, projecting, vascular: yet no corpora lutea were visible." In these subjects, the development of the vesicles had evidently suffered only a very recent arrest, and yet the corpora lutea had become so much diminished as to escape observation.

On the other hand, it cannot be doubted that the corpus luteum of pregnancy does remain, throughout the period of gestation, too bulky and remarkable an object to be very readily overlooked. This is established by the testimony of many other observers, as well as by that of the foregoing cases. Raciborski,\* indeed, not recognizing any difference between the two classes of yellow bodies, goes so far as to deny positively that the corpus luteum is ever visible at the termination of pregnancy. "We are," he says, "at a loss to understand the grounds upon which most of the writers on midwifery and legal medicine have laid down the presence of a corpus luteum in the ovaries as the sign of a recent delivery. The process of ovulation having been suppressed during the period of pregnancy, the pretended corpora lutea, which are only different forms of the anatomical marks of preceding ovulations, have had more than sufficient time to become entirely effaced, and we never meet with

anything more than feeble traces of them in women who die after delivery."

The direct testimony, however, of many reliable authors, such, for instance, as those quoted in Dr. Knox's table, is certainly not to be outweighed by a sweeping assertion like the foregoing; particularly, as many of the descriptions are accompanied with drawings. Montgomery gives quite a number of coloured plates of the corpus luteum at different periods of pregnancy; and states, with regard to the time of its disappearance,\* that he has met with it "distinctly visible so late as the fifth month after delivery." Dr. Lee, in his "Lectures on Midwifery," already referred to, gives two wood-cuts of corpora lutea; one of them in the second month of pregnancy, half an inch in length, and the other in the fourth month, nearly seven-eighths of an inch in length.

William Hunter, also, in his plates of the gravid human uterus, gives two representations of the corpus luteum. One, at the beginning of the fifth month, is three-quarters of an inch in length, and nine-sixteenths in depth; the other, at term, is nearly circular in section and half an inch in diameter.

Fig. 15.



William Hunter's plate of the human corpus luteum, at the beginning of the fifth month.

Fig. 16.



William Hunter's plate of the human corpus luteum at term.

\* Op. cit. p. 227.

The foregoing account of the corpus luteum of menstruation and pregnancy must be considered as differing, to some extent, from all the observations hitherto published. Sufficient, however, has already been said in a previous part of the treatise to show the discrepancy which has existed among authors on the subject, and to demonstrate the justice of Raciborski's remark, that "science has so far possessed only vague ideas, or rather assertions altogether false on the nature of the alterations which merit the name" of corpora lutea. A memoir by Dr. Frank Renaud, however,\* has already been mentioned as containing much the best account of these bodies heretofore published. That writer, nevertheless, does not acknowledge the regular and periodical discharge of ova and formation of corpora lutea; consequently, those bodies which he designates as "false corpora lutea" he does not regard as necessarily connected with menstruation. "The theory," he says, "that would indicate each menstrual period to be co-existent with the secretion of a small yellow body in the ovaries requires facts much more imperative than any yet advanced." He therefore thinks it best to "receive with caution a theory that requires so much show of ingenuity for its establishment."

Dr. R. also lays down one or two points of distinction between "true and false" corpora lutea which it would be impossible to admit, according to the observations in the present paper. He states, for instance, that "the yellow secretion of the false corpus luteum is contained within the inner ovisac;" but that "true corpora lutea are always to be found located between the proper tunics of the Graafian follicles, or, in other words, between the two ovisacs." In reality, the *situation* of the yellow matter in the two bodies is the same; it varies only in amount, and in some peculiarities of intimate structure.

Another distinction of Dr. Renaud is that the true corpus luteum is vascular, while the false is destitute of vessels, and cannot be injected.

Reasons, however, have already been given for believing that the distribution of vessels is the same in both bodies, though they are certainly often more distinct to the eye in the "true corpus luteum," owing to the dull colour of the yellow matter and the greater depth of its anfractuosités.

Neither does Dr. Renaud, in his memoir, give any such regular

\* Edinburgh Monthly Journal of Med. Science, Aug. 1845.

and detailed comparison of true and false corpora lutea as could be called a demonstration of the difference between them. Indeed, it was only by a reference to previous observations of my own that I was enabled, on meeting with Dr. R.'s paper, to recognize its great superiority, in point of accuracy, to the numerous other accounts, whose conflicting statements have involved this subject in so much confusion. How otherwise, indeed, could one ever be enabled to discriminate in a case like this, where the facts are so obscure and the opinions of authors so various? It is only by arranging a detailed history of the corpus luteum, and by offering the proofs together with the assertions, that we can ever expect to settle the question in a manner satisfactory to the general reader.

## PART III.

### OBSERVATIONS ON ANIMALS.

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It so frequently happens that a great deal of light is thrown upon obscure portions of human physiology by parallel observations on the lower animals, that it seems hardly excusable, in a question involving much difficulty, to neglect so obvious a source of additional information. Consequently, it has been thought best, in the present instance, to extend our inquiries concerning the corpus luteum into other classes of the mammalia. Among the best subjects for that purpose are the cow and the sheep; not only on account of the comparative ease with which specimens can be obtained from healthy subjects slaughtered for the market, but also from the circumstance that, in a large proportion of these cases, the animal is found to be more or less advanced in the early part of pregnancy. The writer having also been favoured by chance in obtaining one or two specimens from the cow at a much later period of gestation, it was thought too good an opportunity for investigation to be lost; and he has been enabled, accordingly, to obtain a series of corpora lutea in their different stages, which, though not quite complete, will not, it is thought, be found entirely without value.

The frequency with which the periods of heat recur in these animals also affords an opportunity of examining an abundance of corpora lutea unconnected with pregnancy. Indeed, among all the cases in which these observations were made during the months of December and January, I never failed to discover these bodies in the ovary except in a few instances, in which the animals were very young, and ovulation had evidently not yet been fully established.

The exact periods at which the venereal excitement returns is not very easily ascertained. The butchers and drovers vary a little in their account of it; some stating the interval, in the cow, to be about six weeks; others about four weeks. In the sheep, during cool weather, it is said to be even less than that. I am informed,

however, by Col. Jacques, of Medford, who has been for many years an extensive breeder, that the cow, if kept from the bull, is at heat, for twenty-four hours, as often as once in two or three weeks throughout the year. With regard to the sheep, he is not so positive, but thinks that the periods return about as frequently as in the cow.

For our present purposes, indeed, it is not necessary to ascertain these intervals precisely. It is sufficient to know that they are very short, in order to comprehend how rapidly the corpora lutea become atrophied and disappear, unless their ordinary course of development is modified by the occurrence of pregnancy.

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### OBSERVATION XIX.

**A Graafian vesicle recently ruptured—Corpus luteum of the preceding ovulation retrograde—Eight others quite obsolete.**

I OBTAINED the uterus and ovaries of a healthy cow, slaughtered for the market, December 12th, 1850. The uterus was empty, and there was nothing of note discovered in the tubes.

One of the ovaries was of the usual size, and without any remarkable appearance externally on a superficial examination. There were quite a number of Graafian vesicles to be seen, not prominent, but easily detected at various spots immediately underneath the peritoneum. On close examination, an opening was discovered on one of the lateral surfaces of the ovary leading into the interior of a Graafian vesicle. The walls of the vesicle had collapsed at the surface of the ovary, and the edges of the aperture having consequently been brought in contact, the opening was not at first noticeable. On distending the vesicle, however, with a blowpipe, it became very distinct, of an oval form, with thin sharp edges, and a little over one-sixteenth of an inch in length. (Fig. 17.) There was no ragged or lacerated appearance, nor any unusual vascularity about the rupture, nor any effusion of blood. The vesicle, cut open, was quite empty, and its walls smooth, shining, and vascular as usual. It was of a very moderate size—not over a quarter of an inch in diameter—while very near it was another vesicle, unruptured, half an inch in diameter. Except for the opening in its walls, the ruptured vesicle could not have been distinguished from any other.



The opposite ovary had on its free edge a roundish yellow spot where the fibrous tunic was wanting. There was no prominence at this spot, but immediately underneath was a corpus luteum of considerable size, but still evidently retrograde. This body was solid, with a nearly circular section, five-eighths to three-quarters of an inch in diameter, and showed very plainly the deep foldings of the yellow walls, with a white cicatrix in the centre, from which a wavy line proceeded to the exterior of the ovary indicating the situation of the rupture. (Fig. 18.) The substance of the wall was softish, of a bright stone-yellow colour. Its exterior presented a very thin investing membrane, to which it was so closely adherent that it could not be separated without tearing open the convolutions, and which had, indeed, the appearance of a mere *membranous surface*. External to this were numerous and dense laminæ of cellular tissue.

Fig. 17.



Ovary of an unimpregnated cow; showing a recently-ruptured Graafian vesicle, as it appeared distended by the blowpipe.

Fig. 18.



Corpus luteum of the unimpregnated cow at the time of the rupture of the succeeding vesicle.

There were also in the same ovary five superficial obsolete-looking bodies, corresponding to coloured spots on the surface. The largest was three-sixteenths of an inch deep, and of a dingy-yellow colour, the others successively diminishing in size, and of a brick-red tinge. They were all of a close, reticulated-looking texture, and without any distinct investing membrane, but immediately connected with the ovarian tissue, so that they could not be enucleated.

The larger still showed a whitish or transparent central cicatrix, but the smaller presented no trace of it.

The other ovary also contained three similar bodies.

There were many Graafian vesicles to be seen, of moderate size and slightly prominent on the surface.

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## OBSERVATION XX.

Ruptured Graafian vesicle in process of transformation into a corpus luteum.

A cow was slaughtered December 12th, 1850, of which the uterus was empty.

One of the ovaries, an inch and a half in length, showed at one extremity a circular spot, a quarter of an inch in diameter, where the fibrous tunic was wanting. There was at this spot a slight eminence, of a very pale yellowish tinge, hardly differing from that of the rest of the ovary except just at its summit, where it was deeply stained of a blood-red colour, and about its circumference, where there was a bright circle of vascularity. The peritoneum extended completely over its surface. (Plate III. Fig. 1, *b*.)

On the other extremity of the organ was the yellow protrusion of a retrograde corpus luteum. This protrusion was of a light yellow colour and of an oval form, measuring three-eighths of an inch in its long diameter. The corpus luteum underneath could still be felt through the ovarian parietes. (Plate III. Fig. 1, *a*.)

On making a longitudinal incision, so directed as to pass through the centre of each of these spots, a body was found, situated beneath the first, three-eighths of an inch deep, and of a yellowish-white colour, like fibrin, hardly differing in tint from the remainder of the ovarian tissue. It contained a cavity, the proportionate size of which is represented in Plate III. Fig. 2, *b*. This cavity communicated by a wide passage with the exterior of the ovary, where, however, it was closed by peritoneum, which had been reproduced over the summit of the prominence. The cavity contained a little reddish serum and a plug of fibrin, lying loose towards its deeper part, but adherent to the peritoneum where it extended over the top of the passage. *There was no lining membrane to the cavity*, but the plug was in immediate contact with the foldings of the wall which pro-

jected into the interior. These convolutions could be readily separated and unfolded from the inside. Externally the wall was adherent to a single thin vascular membrane, with which it could be removed entire; and beyond this were the usual irregular layers of cellular tissue. The corpus luteum at the other extremity of the ovary was a little over half an inch in depth, and of a bright yellow colour, slightly tinged with orange. (Plate III. Fig. 2, a.) It was solid, and of rather a firm consistency; its central cicatrix somewhat indistinct, but its substance everywhere intersected by streaks of dense cellular tissue, which appeared to have encroached upon the yellow matter. The substance of this corpus luteum had the same relation to the external parts as in other cases; only the adhesion between its proper membrane and the outer layers of cellular tissue was closer than in the earlier specimens, so that it could not readily be enucleated. The outer layers were also particularly thick and dense.

The same ovary had on its surface two small brick-red spots, corresponding to obsolete corpora lutea of the same colour: the largest an eighth of an inch deep. The other ovary contained six similar bodies, the largest, which was yellowish in colour, one-quarter of an inch in diameter; the others were red, and diminished successively in size. Both ovaries showed several slightly prominent Graafian vesicles, the largest three-eighths of an inch in diameter.

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## OBSERVATION XXI.

Corpus luteum of the cow at its maximum of development—Eight others obsolete.

UTERUS and ovaries of a cow slaughtered December 11th, 1850. The uterus was empty.

One of the ovaries measured one inch and three-eighths in length. On its free edge was a large yellowish eminence, of a rather firm consistency, the summit of which was destitute of fibrous covering, and had the aspect of a protruding fungous growth, invested only by peritoneum, which allowed the yellow colour of the corpus luteum to show through very distinctly. (Plate III. Fig. 3.) This fungous protuberance was of an oval shape, and nearly three-fourths of an inch in its long diameter. About its base, where the fibrous tunic of the

ovary terminated, was a somewhat distinct constriction. Its centre showed a distinct, radiated, white line. The sides of the eminence towards its summit were covered with large red and purple vessels.

On a longitudinal section, the corpus luteum was seen to be of very large size; nearly one inch in its long diameter. It was solid, with a distinct, central, whitish, radiated cicatrix, and strongly marked convolutions. Its colour was yellowish, with an orange tint. There were some minute red vessels, ramifying in the interstices of the convolutions. (Plate III. Fig. 4.)

This corpus luteum had the same relations to the investing membranes as in other cases, *i. e.*, it was covered externally by a single, thin, transparent, vascular tunic, to which it was adherent, and outside of this membrane were several irregular layers of cellular tissue, forming a nidus or receptacle for the body. The first membrane penetrated all the sinuosities of the yellow matter, as the pia mater penetrates between the convolutions of the brain, while the cellular layers passed directly across them, in the manner of the arachnoid.

The ovary contained also Graafian vesicles of moderate size, varying from three-sixteenths of an inch in diameter downward, and four coloured spots on its surface, marking the situations of obsolete corpora lutea. The largest of these latter bodies was a quarter of an inch in depth, and of a yellowish colour. The others diminished successively in size, and were of a brick-red tinge. They were similar in texture to those already described in previous observations.

The opposite ovary contained four obsolete reddish-yellow bodies superficially situated, and many Graafian vesicles, some of which were moderately prominent; the largest half an inch in diameter. Nothing else remarkable.

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## OBSERVATION XXII.

Corpus luteum of the cow, beginning to retrograde—Graafian vesicle in the opposite ovary very prominent, and near the time of rupture—Eight obsolete corpora lutea.

UTERUS and ovaries of a cow slaughtered Dec. 5th, 1850. The uterus contained several drachms of a clear, serous-looking fluid, but no foetus nor any distinguishable ovum.

One of the ovaries was one inch and three-eighths in length.

It was, for the most part, pale externally. Its surface showed some slight sinuosities, and three small yellowish-red spots, the longest measuring nearly one-eighth of an inch. There were also several translucent Graafian vesicles, situated immediately beneath the albugineous tunic, but none so prominent as to distend the peritoneal coat. On one of its lateral surfaces was a bulky, nipple-shaped protuberance, of a yellowish colour, and firm, resisting feel. It was covered with a few small red vessels, but the vascularity was much less pronounced than in the preceding case. In other respects, it resembled that last described, except for being considerably smaller. On the sides of the protuberance the albugineous tunic was much thinned and nearly transparent, and on the summit it was entirely wanting for a space of rather more than three-eighths of an inch diameter, where the surface was very yellow, and had a soft, velvety appearance. The middle of the summit showed an indistinct, whitish, radiated line, with small red vessels ramifying from it as a centre. (Plate III. Fig. 5.)

This protuberance was formed by the projection of a corpus luteum, which, on a section, was seen to be of an ovoid shape, three-quarters of an inch in its longest diameter, and of a stone-yellow colour. It was solid, with a central linear cicatrix, and numerous convolutions visible throughout its substance. It showed no vessels except a few occasionally penetrating the interstices between the convolutions. There were none whatever in the substance of the yellow matter. As in the cases already described, the yellow matter was closely adherent to a thin, transparent, vascular investing membrane, and there was no distinct membrane external to this; only irregular laminae of cellular tissue. (Plate IV. Fig. 1.)

On cutting through the three reddish spots on the surface of the ovary, there was found immediately beneath each a flattened solid body, of a nearly brick-red colour, and appearing to the naked eye composed of areolar tissue. The two larger were nearly three-sixteenths of an inch in diameter; the third was somewhat smaller. A central cicatrix was easily distinguishable. They were tough, and closely adherent to the adjacent ovarian tissue. They had no distinct investing membrane, and could not be enucleated from the ovary.

The opposite ovary contained numerous Graafian vesicles in active development. One of them was exceedingly large and prominent, nearly three-quarters of an inch in diameter, and protruding strongly from the surface of the ovary. The tunics of the ovary were very thin over the whole prominence, and at its summit seemed reduced

merely to a layer of peritoneum. A few red vessels ramified over

Fig. 19.



Ovary of an unimpregnated cow; showing a prominent Graafian vesicle.

the surface of the vesicle, which was filled with a transparent, colourless, albuminous fluid, holding in suspension minute whitish flakes and shreds. The lining membrane of the vesicle was smooth, transparent, and vascular, not at all folded or discoloured; having, indeed, every way its usual appearance.

The ovary had besides upon its surface five small yellowish or red spots, each of which corresponded to a flattened reddish body, situated immediately beneath, precisely like those in the other ovary.

### OBSERVATION XXIII.

*Corpus luteum of a cow about three and a half months pregnant.*

THIS cow was slaughtered Dec. 7th, 1850. One of the uterine cornua contained a foetus weighing a pound and a half. The eyelids of the foetus were agglutinated. The skin was perfectly naked, and covered with a fine vascular network.

The ovary corresponding to that horn of the uterus which contained the foetus, presented on one of its lateral surfaces a yellowish projection, similar to that described in Observation XXII., only not quite so prominent. Its summit had the same softish, velvety appearance, with a central radiated white line. The substance of the corpus luteum, however, felt through the ovarian walls, was not so firm and resisting as in the preceding case, but softish, and even gave to the fingers an indistinct sense of fluctuation. On making a longitudinal incision, the corpus luteum was found to be very large, measuring five-eighths of an inch in depth. It was solid like the others, and had a very evident white, radiated, central cicatrix. Its substance was of a rich, soft, pulpy consistency, and its colour was a deep orange yellow, very distinguishable from the pale stone-

yellow of the preceding observation. Its relations to the investing membrane, &c. were the same as in previous cases. (Plate IV., Fig. 2.)

Beside this body, the ovaries contained five obsolete bodies of a brick-red colour and three of a dingy yellow, the situation of which was marked by similar spots on the surface. The structure of these obsolete bodies was the same as has been already described in previous cases.

There were no projecting Graafian vesicles in either ovary, but an abundance of them, of moderate size, buried beneath the albugineous tunic.

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#### OBSERVATION XXIV.

Corpora lutea of cows, from five to six and a half months pregnant.

On the 20th of Dec. 1850, I obtained the uterine organs of three cows which had been slaughtered within a day or two.

The first uterus contained a well formed foetus that weighed a little over five pounds. The ovary corresponding to the uterine horn which enclosed the foetus, contained a corpus luteum, ovoid in shape, of a softish, rich, pulpy consistency, and a deep orange-yellow colour, and measuring seven-eighths of an inch in length, by five-eighths in depth. Its section showed plenty of vessels in the interstices of the convolutions. There was also some vascularity externally, on the sides of the tumour.

The ovaries contained also three obsolete corpora lutea of a brick-red colour, the largest of which was one-eighth of an inch in depth.

There were also several Graafian vesicles, slightly prominent, the largest a little over a quarter of an inch in diameter.

The second uterus contained a foetus weighing a little less than ten pounds. The ovary, corresponding to the pregnant horn of the uterus, contained a corpus luteum of an ovoid shape, rather over seven-eighths of an inch in length by three-quarters in depth. It was soft and pulpy, and of a very strong orange-yellow colour. There was no vascularity externally.

The ovary contained also three obsolete bodies, very small and of a red colour, and several Graafian vesicles, one of which was slightly prominent but the others nearly or quite concealed beneath the ovarian integuments.

The other ovary was in an extremely inactive condition, though natural in structure. It presented absolutely no obsolete corpora lutea, and no Graafian vesicles at all prominent.

The third uterus contained a foetus weighing fifteen pounds. The ovary corresponding to the pregnant horn presented a soft and pulpy corpus luteum, measuring one inch in its long, and fifteen-sixteenths of an inch in its short diameter, and of a deep orange-yellow colour. There was no vascularity externally. The ovaries contained, beside, only two obsolete red bodies. There were no prominent Graafian vesicles, and only a few small ones superficially situated.

## OBSERVATION XXV.

Corpus luteum of a cow about six and a half months pregnant.

THE COW was killed on the 12th of December, 1850. The uterus

Fig. 20.



Corpus luteum of a cow about six and a half months pregnant.

contained a foetus weighing sixteen pounds. The eyelids were still agglutinated, but could be separated by gentle traction. Hair was just beginning to show itself on the forehead, but the remainder of the skin was quite naked.

The ovary corresponding to the pregnant horn of the uterus was one inch and five-eighths in length. One end of it was occupied by a yellowish tumour, on the summit of which was a nearly circular spot where the fibrous tunic was wanting, and the yellow colour consequently more distinct. The tumour was of a rounded form and a softish consistency. Its sides were pretty abundantly covered with red and purple vessels.

The section of this corpus luteum was solid, but its central cicatrix was still easily recognizable. The body was of an ovoid shape and measured one inch and one-eighth in its long diameter. Its sub-



stance was of a strong orange colour, and presented in a high degree the soft, rich, pulpy aspect, already observed as belonging to the corpora lutea of pregnant cows. The structure of the body was the same as in the preceding cases.

The ovaries contained also one obsolete corpus luteum of a red colour, and five others of a yellowish tinge; but the latter were all exceedingly small and very faint. Nearly all the Graafian vesicles were situated entirely underneath the albugineous tunic. None observed prominent.

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## OBSERVATION XXVI.

Corpus luteum of a cow eight months pregnant.

A cow, belonging to Mr. Potter, of Cambridge, was found to be sick on the morning of Friday, November 29th, 1850. She had been covered by the bull in the early part of April in the same year, and had been with young ever since. The animal appeared dull, seemed to suffer from pain internally, and had some coolness of the ears and horns. She rapidly grew worse, and on Sunday there was much vomiting and swelling of the abdomen. She died on the afternoon of Sunday, having a short time before expelled a calf that weighed thirty-three pounds.

At the examination of the body, on the same day, there was found very extensive peritonitis which appeared to radiate from a spot on the surface of the "paunch," or first stomach, corresponding in situation to a similar spot of ecchymosis in the thickness of the abdominal parietes. The animal had apparently received a blow in the abdomen which gave rise to peritoneal inflammation.

The left horn of the uterus, moderately contracted, still contained the greater part of the membranes belonging to the fetus which had been expelled. The right horn contained a second fetus, dead, but quite fresh looking, and well developed. Its weight was forty-two and a half pounds.

The left ovary was one and a half inches in length. It had no well marked cicatrices on its surface, but showed at one extremity a slightly prominent Graafian vesicle, three-sixteenths of an inch in diameter. There were also numerous others, much smaller, on the lateral surfaces of the organ. On the free edge of the ovary there

was an abrupt prominence, a quarter of an inch in height and three-eighths in length, of a faint orange-yellow colour. The peritoneum was continuous over the whole of the tumour, and on its summit there was a faint, whitish, radiated cicatrix. The base of the tumour was somewhat constricted, and just at the line of constriction, there existed some purplish vascularity.

Fig. 21.



Ovary of a cow, eight months pregnant; showing the prominent portion of a corpus luteum.

On making a longitudinal section of the ovary, through the remains of the cicatrix, the whole corpus luteum was exposed, and the external projection was seen to form only a small part of the entire body. It measured nine-sixteenths of an inch in its long, and three-eighths of an inch in its short diameter. It consisted of a tolerably firm, solid mass, of an ovoid shape, and of an exceedingly rich orange-yellow colour, which was uniform throughout. There was no cavity anywhere, but about the edges of the section might be seen the marks of previous compression and folding; and a faint, narrow, nearly straight line ran from the most projecting part, a considerable distance into the interior of the body. The projecting part appeared to have been folded down toward the lower extremity of the ovary, and confined in that position by the contraction of the investing membranes. (Pl. IV., Fig. 3.)

The substance of the corpus luteum was of a highly organized appearance. No vessels, however, were to be seen in it, except where they ramified in the furrows about its edge. Its relations to the surrounding tissues were the same as in preceding cases.

The right ovary was one and three-quarter inches in length. Its surface was like that of the other, showing one Graafian vesicle, about one-fourth or three-sixteenths of an inch in diameter, and many other smaller ones. On the free edge of the organ was an orange-yellow spot like that on the left, only not projecting. The corpus luteum which was situated beneath was entirely similar to that in the left ovary, except in being somewhat larger, and in having near its centre a small, narrow, white, radiated cicatrix, from which a faint whitish line ran to the external surface of the corpus luteum, on the free edge of the ovary. (Fig. 22.)

There were no other marks or spots observed on the surface of the ovaries indicating corpora lutea.

It is evident, from the foregoing observations, that the formation of the corpus luteum in the cow is very similar to that which takes place in the human female; the difference between the two consisting only in details, while the general plan remains the same. There is in the first place, no yellow matter deposited, as some writers have maintained, previous to the rupture of the vesicle; but, at the time when this occurrence takes place, the walls of the vesicle are smooth and membranous, presenting indeed altogether their usual appearance.

Fig. 22.



Ovary of a cow eight months pregnant.

Soon afterward, however, a growth takes place from the inner surface of the cavity, and assumes the same convoluted form as in the human species. In the cow, however, this new growth is much more rapid and abundant. It soon completely fills and distends the cavity of the vesicle, and even sprouts luxuriantly from its aperture, in the manner of a fungous growth; forming a very noticeable protuberance on the surface of the ovary. The peritoneum is soon reproduced over this protuberance, and the sides of the tumour are covered with vascularity. The substance of the corpus luteum, which was at first of a pale undefined hue, like recent lymph, has now acquired a strong yellow colour, and presents a solid mass of an ovoid shape, with its centre occupied by a pale, radiated cicatrix, the result of the closing together of the vesicular parietes.

The corpus luteum seems to attain this condition in about two weeks after the discharge of the ovum. After that period it follows a retrograde course, which is characterized by the following changes. The central cicatrix becomes more and more indistinct. The yellow matter changes its colour to a dull yellowish-brown, and afterward most commonly to a brick red; though there is reason to believe that the latter alteration does not invariably take place. At the same time it contracts a more intimate adhesion with the neighbouring parts, and its investing membrane becomes confounded with the adjacent areolar tissue; so that at last it appears as a mere spot, or *islet*, in the ovarian substance, presenting to the eye a reticulated appearance, and incapable of being separated from the ovary :

entire body. There are usually several of these obsolete bodies, of different sizes, to be seen in the ovaries together, provided the animal is not pregnant; their situations being indicated by small red spots on the surface of the ovary.

The difference in aspect between the corpus luteum following an ordinary ovulation, and that which accompanies pregnancy is not so striking in the cow as in the human female. This is apparently owing to two circumstances; first, that in the cow there is, at the time of the rupture of a vesicle, but little or no hemorrhage into its cavity; and secondly, that the growth of yellow matter which takes place afterward, is so much more rapid and abundant. It will be recollected that one of the most important distinctions between the human corpus luteum of menstruation and that of pregnancy was the thickness of its yellow wall, as compared with the central coagulum; and since in the cow there is little or no central coagulum, and since the yellow wall always becomes thick enough to fill the cavity of the vesicle, the above distinction cannot be here applied. Nevertheless, there is another equally important distinction which still remains applicable, viz., the longer duration of the corpus luteum, when its growth is modified by the occurrence of pregnancy. It has been demonstrated (Obs. XVI.) that, at the time of the rupture of a vesicle, the corpus luteum of the preceding ovulation has already become distinctly retrograde; its colour considerably lighter, and its size reduced. Before the new vesicle has assumed entirely the appearance of a corpus luteum, the old yellow body (Plate III., Fig. 2, *a*) has become still farther atrophied; its cavity entirely obliterated, its central cicatrix indistinct, and the whole body reduced to not more than a quarter part the size which it had at the period of its greatest development. (Plate III., Fig. 4.) It appears, therefore, to be sufficiently well ascertained that, in this animal, the corpus luteum ordinarily reaches its maximum of development in about two weeks after the rupture of the vesicle, and that a period of three weeks longer reduces it to the condition of a small, obsolete, yellowish or brick-red spot, without any investing membrane, and not presenting any of the ordinary characteristic appearances of a corpus luteum.

On the other hand it is certain, that if the rupture of a Graafian vesicle is followed by pregnancy, the corpus luteum does not attain its greatest size till about the middle of the seventh month (Obs. XXIV. and XXV.) and that at the termination of the eighth month (Obs. XXVI.) it is still of large size, and sometimes forms a very remarkable prominence on the surface of the ovary. At the same

time, the obsolete bodies which mark the situations of still older ruptures gradually disappear from the ovary; so that, toward the latter periods of gestation, the corpus luteum of the last rupture is the only body of the kind to be found in the organ. In those cases, however, in which impregnation has not taken place, it is not at all unfrequent to find beside the principal body, six, seven, or eight others, in different stages of retrogression.

The substance of the corpus luteum of pregnancy, also, is always of a soft, rich, pulpy consistency, and its colour a very deep orange-yellow; while in the unimpregnated animal its texture is firmer, and it presents an orange tinge only for a very short period of its existence; the colour being, for the most part, a very light stone-yellow.

Numerous observations on sheep have demonstrated the fact, that a similar distinction exists in them between the corpus luteum of ordinary ovulation and that of pregnancy. The rupture of the vesicle in this animal, as in the cow, is unaccompanied by any considerable hemorrhage, and the new growth is afterward produced with a similar rapidity and luxuriance. Its colour is not by any means so brilliant as in the cow, but is a dull yellowish white. After the bodies become completely obsolete they present a dusky brownish spot, without any tinge of red. In the retrograde corpus luteum of the sheep, there is sometimes to be found a cavity containing a few drops of clear fluid, and a lining of transparent lymph. This, however, is only an occasional appearance, and seems to be owing, as in the human subject, to the accidental closure of the mouth of the vesicle, before the complete coalescence of the walls in its interior.

With these exceptions, the growth and atrophy of these bodies follow nearly the same course as that which has already been described. At the time of the rupture of a new vesicle, the old corpus luteum, of a fortnight or three weeks previous, has become much reduced in size, and considerably paler in hue; while the occurrence of pregnancy causes it to remain for a long time nearly undiminished in size, and unchanged in colour.

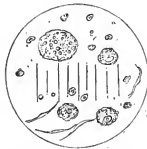
The microscopic appearances of the corpus luteum are nearly the same in the cow and sheep; the only difference consisting in the amount of oil present, which is quite abundant in the former, and rather scanty in the latter; at least, until a late period of its development. There are to be seen, in the substance of the convoluted wall, an abundance of pale, roundish, or irregularly elongated cells, faintly granulated, sometimes containing minute drops of oil, and often, particularly in the early periods, circular or oval nuclei, with nucleoli.

Fig. 23.



Cells from a corpus luteum of the cow, at its maximum of development. (Obs. 21st.) Each division of the scale is about .0004 of an inch.

Fig. 24.



Cells from the corpus luteum of a cow, six months pregnant. (Obs. 24.) Same scale.

The nuclei may sometimes be seen floating about the field, unprovided with any cell-membrane. While the corpus luteum is in its early stages, there is also a large quantity of the spindle-shaped cells of areolar tissue in process of development, to be seen in intimate connexion with the other elements.

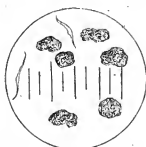
As the corpus luteum grows older, the spindle-shaped cells are less numerous, and the oil, which is evidently secreted by the larger cells, becomes more and more abundant, as the latter are atrophied and disappear. Finally, the whole field is occupied by globules of oil, of various sizes, while the cells are too few, or too indistinct to attract the notice of the observer.

Fig. 25.



Cells from the corpus luteum of an unimpregnated ewe, in an early stage of its development. Same scale.

Fig. 26.



Cells from the corpus luteum of an unimpregnated ewe, which was commencing to become retrograde. Same scale.

## APPENDIX.

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SINCE the foregoing essay was written, and delivered to the Committee, I have met with the two following passages relative to the corpus luteum, which contain the same or similar views with those expressed in the present memoir. The first extract is from a work by Drs. Kirkes and Baly, published in London, in 1848, and entitled a "*Supplement to the Second Volume of Müller's Physiology*." I am indebted to Prof. O. W. Holmes for calling my attention to the passage in question. It is as follows:—(page 55.)

"In the figures given by Sir E. Home and M. Bischoff of corpora lutea formed under these circumstances (without impregnation), it is evident that the growth of the yellow substance has proceeded to such an extent as to protrude from the orifices of the ruptured follicles, after filling their cavities. These are certainly corpora lutea which could not be distinguished from corresponding bodies of the same stage of development in the ovaries of impregnated animals. In the impregnated animal, however, the corpus luteum continues to increase in size after the orifice in the follicle has closed; and whether this is the case in animals which are not impregnated is doubtful. It is probable that if the ova have not been fecundated, the state of orgasm of the ovaries and Graafian follicles, which arose during the condition of heat, subsides, and that the corpora lutea then, instead of continuing to grow, quickly shrivel and disappear."

"With regard to the human female," the author proceeds to remark, "the limitations with which the rule may be admitted are greater," and, although he recognizes the fact that corpora lutea formed in consequence of menstruation are, generally, smaller than those following pregnancy, no other distinction between them is mentioned, than their difference in size. Even this is not considered as altogether reliable, and the author comes accordingly, to the following conclusion. "If, in addition to the foregoing facts and considerations, the varieties in size of the corpora lutea formed during pregnancy are borne in mind, it will be seen that cases can seldom occur where the mere presence of one of these bodies can be taken

as a proof of previous impregnation," (p. 56.) The writer, therefore, does not admit entirely the difference of development in the human corpora lutea of menstruation and pregnancy as forming a distinction between them; and he only considers it as "probable" that such a distinction exists in animals.

The second extract, however, contains expressions more definite and satisfactory. It is from *Longet's Physiology*, Paris, 1850, vol. ii. p. 88, De la Génération.

"At the same time," says Longet, "we must distinguish *two kinds of corpora lutea*; those which result from the cicatrization of a follicle, after the spontaneous expulsion of an ovum, without any subsequent conception; and those which are produced by the same processes, after the expulsion of an ovum followed by conception and especially by gestation. Those belonging to the first class rapidly pass through their different stages, never attain a high degree of development, are much inferior to the others in size, rapidly assume the yellow coloration, fade again in a few days, and in the course of one or two months become retracted and completely concealed in the ovarian tissue. The second species of corpora lutea, participating in the congestion and functional activity, which are established in all the sexual organs during gestation, attain a size sometimes greater than that of the ovary itself, and pass so slowly through the different stages of their development and atrophy, that they are still perceptible at the termination of pregnancy; they gradually diminish in size, in proportion to the growth of the foetus, and the approach of the end of gestation."

The above statements, by Longet, it will be seen correspond entirely with those brought forward in the present essay. They are given by him, however, altogether under the form of general deductions; and the reader is not supplied with any series of observations which would convince him of their reliability. It is in the foregoing pages alone, so far as I am aware, that the difference of the two species of corpora lutea has been absolutely demonstrated; so that the distinction between them no longer rests on bare assertion, but on the evidence of recorded facts.

J. C. D.



## EXPLANATION OF THE PLATES.

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N. B.—ALL the drawings were taken from nature, and are of the natural size.

The figures in the first two plates are all taken from the human subject.

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### PLATE I.

- FIG. 1. Graafian vesicle, recently ruptured and filled with blood. (Obs. 1.)  
FIG. 2. Ovary of a girl three weeks after menstruation; showing the prominence and vascularity over the corpus luteum. (Obs. 6.)  
FIG. 3. The same ovary cut open; showing the corpus luteum of menstruation three weeks old.  
FIG. 4. Corpus luteum of menstruation four weeks old. (Obs. 9.)  
FIG. 5. Corpus luteum of menstruation thirty days old. (Obs. 10.)

### PLATE II.

- FIG. 1. Corpus luteum of menstruation nine weeks old. (Obs. 11.)  
FIG. 2. Corpus luteum of pregnancy about the end of the second month. (Obs. 12.)  
FIG. 3. Corpus luteum of pregnancy about the termination of the fourth month. (Obs. 13.)  
FIG. 4. Ovary of a woman seven months pregnant; showing the prominence of the corpus luteum. (Obs. 14.)  
FIG. 5. The same ovary cut open.

### PLATE III.

- FIG. 1. Ovary of an unimpregnated cow. (Obs. 20.)  
    a. Old corpus luteum seen externally.  
    b. New corpus luteum seen externally.  
FIG. 2. The same ovary cut open.  
    a. Old corpus luteum.  
    b. Ruptured Graafian vesicle in process of transformation into a corpus luteum.

- FIG. 3. Corpus luteum of the unimpregnated cow at its maximum of development. External view. (Obs. 21.)
- FIG. 4. Same as the above. Internal view.
- FIG. 5. Corpus luteum of the unimpregnated cow beginning to retrograde. External view. (Obs. 22.)

## PLATE IV.

- FIG. 1. Same as the above. Internal view.
- FIG. 2. Corpus luteum of a cow about three and a half months pregnant. (Obs. 23.)
- FIG. 3. Corpus luteum of a cow eight months pregnant. (Obs. 26.)
- FIG. 4. Corpus luteum of the unimpregnated ewe at its maximum of development.
- a. External view.
- b. Internal view.
- FIG. 5. a. Ovary of an unimpregnated ewe; showing the aperture of a recently-ruptured Graafian vesicle, and the prominence of the last corpus luteum.
- b. The same ovary cut open; showing the last corpus luteum.
- FIG. 6. a. Ovary of a ewe, the uterus of which contained a fetus eight and a half inches in length.
- b. The same ovary cut open.





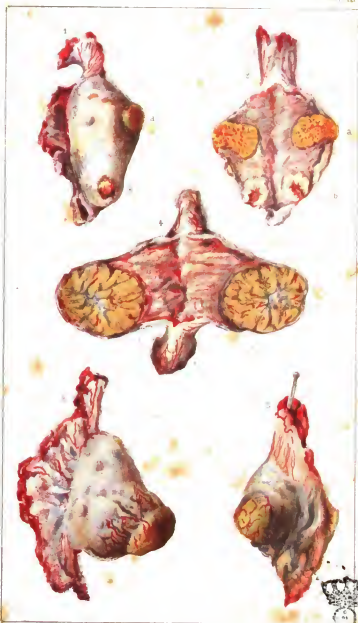
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Tab. 24.

Uterus et Placenta



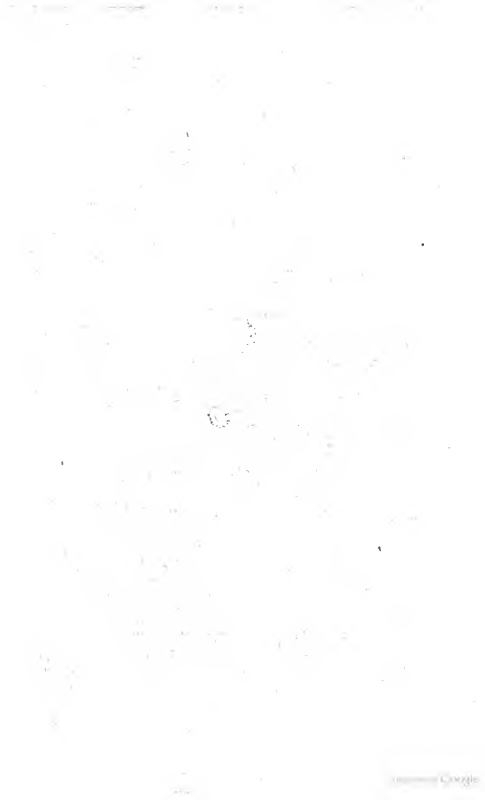


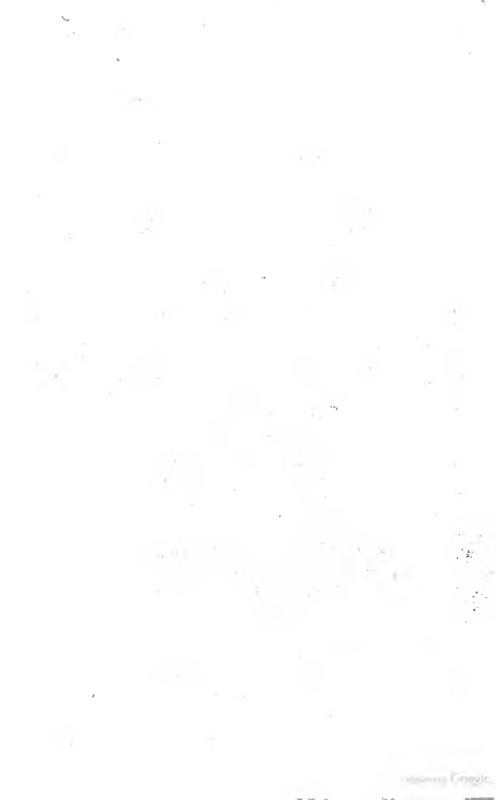


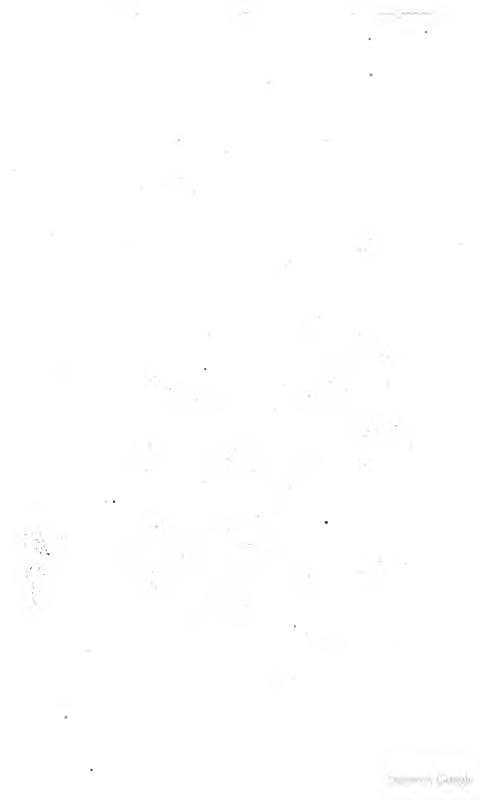


Fig. 1-9

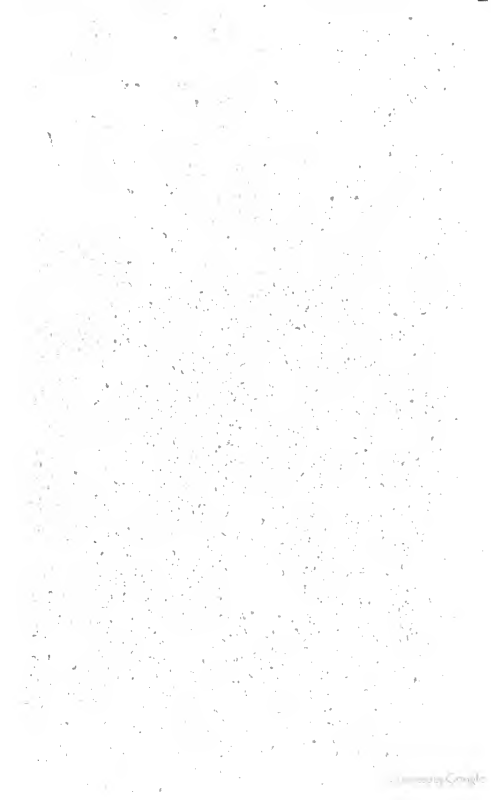






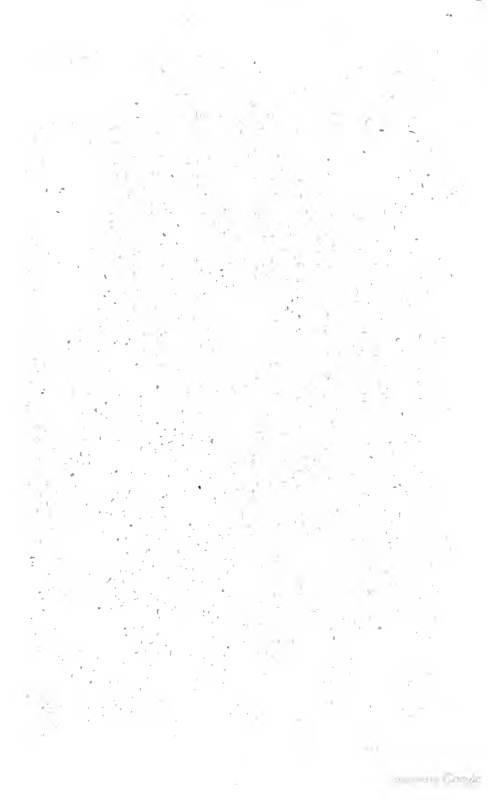












L5



